RENEWAL

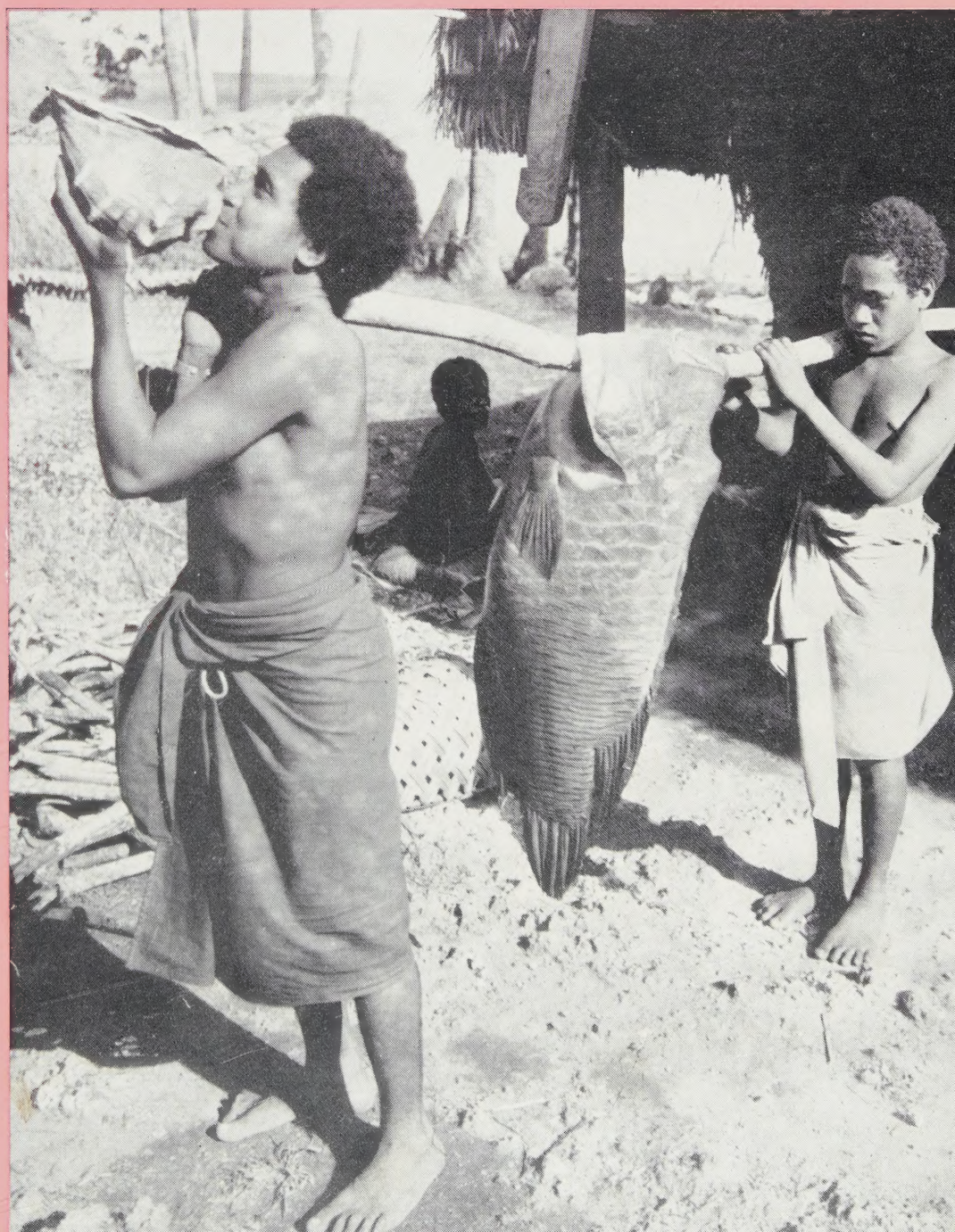
6(4)

SPC
SOUTH PACIFIC COMMISSION

quarterly Bulletin

P.6

NOV 1956
LIBRARY
POFI
FISH & WILDLIFE
SERVICE



2/- STG.

PUBLISHED BY THE
SOUTH PACIFIC COMMISSION
NOUMEA NEW CALEDONIA

October, 1956

W. R. CARPENTER & CO. LTD.

HEAD OFFICE: 16 O'CONNELL STREET, SYDNEY, N.S.W.

ESTABLISHED 1914 - - - - - *CAPITAL* £2,500,000

Over 40 years of Pacific Island Development and Service

ASSOCIATE COMPANIES THROUGHOUT THE PACIFIC:

NEW GUINEA:	New Guinea Company Limited	*RABAUL, KOKOPO, LAE, MADANG, KAVIENG*
PAPUA:	Island Products Limited	*PORT MORESBY*
FIJI:	W. R. Carpenter & Co. (Fiji) Limited	*SUVA* and *LAUTOKA*
	Suva Motors Limited	*SUVA* and *LAUTOKA*
LONDON:	W. R. Carpenter & Co. (London) Ltd., 13 Rood Lane	*LONDON*, E.C. 3

SOUTHERN PACIFIC INSURANCE CO. LTD. **Head Office, 60 Hunter St., Sydney.**
BRANCHES AT: SUVA, RABAUL, MELBOURNE AND NEWCASTLE.

BUYERS AND EXPORTERS OF:

COPRA
COCOA
M.O.P. SHELL
TROCAS SHELL
GREEN SNAIL SHELL
ETC.

COCONUT OIL MILLS:

ISLAND INDUSTRIES LTD.
SUVA, FIJI

COCONUT PRODUCTS LTD.
TOBOI, RABAUL
NEW GUINEA

MERCHANDISE STOCKS CONSISTING OF:

EVERYTHING REQUIRED
IN THE ISLANDS
AVAILABLE AT
ISLAND CENTRES

Inter Island Shipping Services to Plantations in New Guinea and Fiji

DISTRIBUTORS THROUGHOUT THE PACIFIC FOR:—

All types Motor Vehicles, Tractors
and General Merchandise

PACIFIC SHIPPING SERVICE FROM AUSTRALIA VIA NEW GUINEA AND FIJI TO PACIFIC COAST OF CANADA AND UNITED STATES

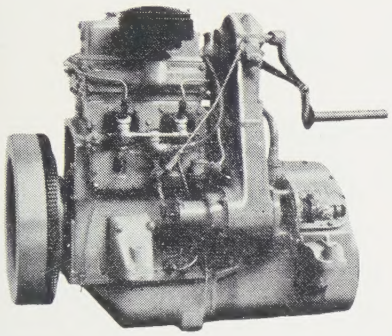
A WORLD-WIDE ORGANIZATION

THORNYCROFT

MARINE DIESEL ENGINES

Thornycroft Marine Engines range from 12 HP—16—20—30—50—90 to 125 HP

For Efficiency — Reliability — and Long Life



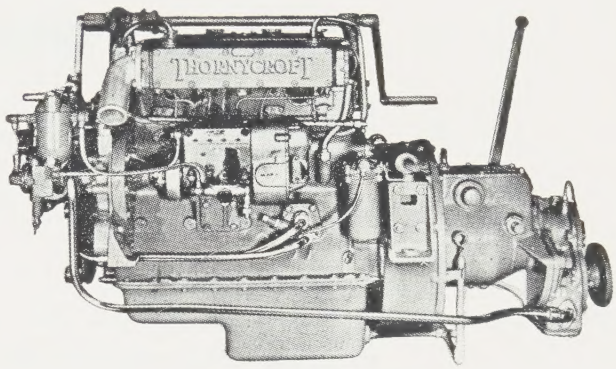
RJD2
16 H.P. "HANDYBILLY" DIESEL MARINE ENGINE
General Purpose or Auxiliary

Ideal engines for twin screw installation.

Smooth running, quiet, light.

← For craft to 27 ft.

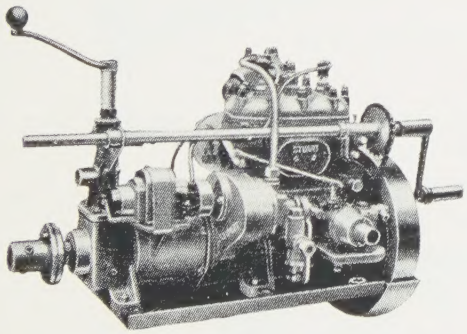
For craft to 32 ft. →



RTR4/D1 30 H.P. GENERAL PURPOSE MARINE DIESEL ENGINE

These engines are ideal for fishing craft as they possess the necessary characteristics. They are simple, orthodox, easily operated, economical power units. Our Sydney Branch has good technical and service facilities available. We always keep a fully comprehensive range of spares on hand. Engines are designed for tropical operation and all Island enquiries are given special attention by staff who have experience in these requirements.

STUART



STUART P55M 8 H.P. MARINE PETROL ENGINE

We are also Pacific Agents for the world-famous **STUART** Marine Engines. These engines are recognised as perfection in their class—they are in 3 sizes—1½, 4 and 8 HP. **STUART** Generating Sets and small wash-down Pumps are also available.

Marine Propulsion Units 1½ to 8 HP.
Marine Generating Sets 300-1500 watts.

Full information from

THORNYCROFT (Aust.) Pty. Ltd.

Box 2622, G.P.O., Sydney. FF 4224
Cables: "Thornmotor", Sydney

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA & NEW ZEALAND LTD.

Suppliers of

- A full range of agricultural dusts, sprays, fungicides, insecticides, fumigants, plant hormones and animal remedies.
- Pharmaceuticals.
- Explosives, ammunition.
- General chemicals for widespread industrial uses.
- Alkalis for the heavy chemical industry.
- Dyestuffs, synthetic fibres and auxiliary products.
- Plastics for all purposes.
- Vinyl coated fabrics for upholstery and Polythene film for packaging, tarpaulins, moisture barriers, etc.

Please enquire through your normal trading channels and if additional information is required communicate direct with

ICI

IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA & NEW ZEALAND LTD.
251 GEORGE STREET, SYDNEY, N.S.W.

ICI/40/FP

A.N.Z. SAVINGS BANK NOW OPEN

at Suva and Lautoka Branches of A.N.Z. Bank in Fiji

Consider the advantages of an A.N.Z. Savings Account

1. You can keep a savings account and a cheque account at the same bank office.
2. Deposits and withdrawals can be made rapidly and simply.
3. Withdrawals without limitation as to amount will be paid on demand at the branch where your account is kept.
4. Interest is allowed on depositors' balances at the rate of 2½% per annum up to the amount of the permissible maximum.
5. World-wide organisation of A.N.Z. Bank provides a complete banking service for savings bank depositors when travelling or sending money overseas.
6. The Savings Bank is guaranteed by A.N.Z. Bank, one of the largest financial institutions in the Southern Hemisphere.

Open A.N.Z. Savings Accounts for yourself and all members of your family . . . encourage children to save for the future by opening accounts in their names and assisting them to make regular deposits.

A.N.Z. BANK

AUSTRALIA AND NEW ZEALAND BANK LIMITED
AUSTRALIA AND NEW ZEALAND SAVINGS BANK LIMITED

Over 850 Branches and Agencies of Australia and New Zealand Bank Limited throughout Australia and New Zealand, in Fiji, Papua and New Guinea, and in London. Agents throughout the world.

ANZ315FP/S.P.C.

"CHULA"

the greatest aid to

better COPRA

NOW manufactured in sizes to suit large or small producers.

Increases production by reducing shrinkage.

Operates in all weathers.

Genuine testimonials can prove our claims.

YOU can produce the highest quality Copra and get better prices by drying

Further details from

TYNESIDE FOUNDRY AND ENGINEERING CO. LTD.

Manufacturers and Sole Patentees

ELSWICK, NEWCASTLE UPON TYNE, ENGLAND.

Cables: "Foundry, Newcastle-on-Tyne". Codes: ABC 5th & 6th Editions.

or from any of these Agents:

PAPUA: The B.N.G. Trading Co. Ltd., Port Moresby.

NEW GUINEA: Burns Philp (New Guinea) Ltd., Rabaul, Lae, Madang and Kavieng.

FIJI, SAMOA, TONGA: Morris Hedstrom Ltd., Suva, Fiji.

SOLOMON ISLANDS: K. H. Dalrymple Hay, Esq., Honiara.

The South Pacific Commission

The South Pacific Commission is an advisory and consultative body set up in 1947 by the six Governments responsible for the administration of Island Territories in the South Pacific region (Australia, France, the Netherlands, New Zealand, the United Kingdom and the United States of America).

The Commission's purpose is to recommend to the member Governments means of promoting the well-being of the people of these territories. It is concerned with social, economic and health matters. Its headquarters are at Noumea, New Caledonia.

The Commission consists of twelve Commissioners, two from each Government. It normally holds one Session each year. There are two auxiliary bodies, the Research Council and the South Pacific Conference.

The Research Council assembles once a year. Members are appointed by the Commission, and are selected for their special knowledge of the questions with which the Commission is concerned, and the problems of the territories in these fields. The chief function of the Research Council is to advise the Commission what investigations are necessary. Arrangements to carry out those that are approved are the responsibility of the Secretary-General and other principal officers.

The South Pacific Conference, which meets at intervals not exceeding three years, consists of delegates from the local inhabitants of the territories, who may be accompanied by advisers. The first Conference was held in Suva in April, 1950, and was attended by delegates from fifteen territories and from the Kingdom of Tonga. The second Conference was held at Commission headquarters in April, 1953. The third Conference was held in Suva from April-May, 1956.

The Commission's staff includes six principal officers, as follows: Secretary-General, Dr. Ralph C. Bedell; Deputy Secretary-General, Mr. John Ryan; Executive Officer for Health, Dr. E. Massal; Executive Officer for Economic Development, Dr. A. H. J. Kroon; Executive Officer for Social Development, Dr. R. Seddon. The powers and functions of the Deputy Chairman, Research Council, are at present being exercised by the Secretary-General.

Further particulars of the Commission's activities may be obtained from the Secretary-General, Nouméa, New Caledonia.

NOTE: A map on which the Commission area is delineated appears on the inside back cover.

Front Cover Photograph

The cover photograph shows Kavataria fishermen with a spectacular catch, which the leader is announcing to the village by blowing loudly on a conch shell.

Fishing and gardening are the traditional pursuits of the Kavataria villagers in the Trobriand Archipelago, which lies 100 miles east of the New Guinea mainland.

The Trobriands are administered by Australia as part of the territory of Papua and New Guinea.

SPC QUARTERLY BULLETIN

VOL. 6. NO. 4. OCTOBER, 1956

CONTENTS

	Page
South Pacific Fisheries Training Course ..	6
The Rhinoceros Beetle In Western Samoa. *A review by C. P. Hoyt*	8
New Zealand Educationist Joins South Pacific Commission	10
Cocoa Planting For The Neophyte. *By D. R. A. Eden*	11
From Subsistence Gardening To Cash Crops. *By J. Barrau and H. S. McKee*	14
Fish Sauces And Pastes Are Palatable And Nourishing. *By H. S. McKee* ..	16
Fish Sauces Prove Popular In Africa	17
A Bookshop For Western Samoa. *By The Rev. N. H. Mapperson*	19
Problems Of Coffee Production In New Caledonia (I). *By E. J. E. Lefort* ..	21
A Cruise In Orsom III. *By Louis Devambez*	25
Economic Progress In Papua And New Guinea. *By John Willoughby* .	28
Preserving Primary Export Products In The Tropics. *By E. J. E. Lefort*	34
Second International Coconut Conference	39
The Mechanization Of Timber Extraction. *By E. J. E. Lefort*	40
Broadcasting In The Pacific	41
"Pacific Reading"—Notes And News ...	49
Book List No. 15 ...	50
Visual Aids ..	54

THE SPC QUARTERLY BULLETIN, first published in January, 1951, features articles on selected activities in the Commission's three main fields of operation: economic development, health and social development. Articles are also contributed by specialists working in these and related fields, in the territories within the Commission area.

THE BULLETIN is given selective world distribution to people and institutions in widely differing fields sharing a common interest in the purposes and work of the Commission. It is published in two editions, English and French.

SUBSCRIPTIONS and orders for single copies should be directed to: South Pacific Commission, Box 5254, G.P.O., Sydney, Australia.

ALL OTHER ENQUIRIES relating to the SPC QUARTERLY BULLETIN should be directed to: The Editor, South Pacific Commission, Box 5254, G.P.O., Sydney, Australia.

SUBSCRIPTION RATES are as follow: One year, subscription 8/- sterling, or $1.15, by surface mail; three years, subscription 20/- sterling, or $2.80, by surface mail. Rates for postage by airmail will be supplied on application.

UNLESS OTHERWISE STATED, all material appearing in the SPC QUARTERLY BULLETIN may be reproduced without prior reference to the Secretary-General, provided that acknowledgment is made to both source and author.

THE COMMISSION does not accept responsibility for statements made in contributed articles.

South Pacific Fisheries Training Course

In October last year, Mr. van Pel brought by air from Manila to New Caledonia, fingerlings of three species of edible pond fish to stock experimental fish breeding ponds at the Port Laguerre Farm School. Here Mr. van Pel (right) and students check aquatic insects taken from the ponds.

Twenty-five trainees from fourteen Pacific territories will attend the Fisheries Training Course scheduled to open at Commission headquarters on November 19. The Course, which will last about ten weeks, will be under the direction of the Commission's Fisheries Officer, Mr. H. van Pel, with a fisheries technologist from the Food and Agriculture Organization as co-director. This article briefly explains the reasons for holding the Course, and gives details of the curriculum.

By H. VAN PEL

MOST of the people living on the many hundreds of islands within the scope of the South Pacific Commission obtain a large part of their food from the sea or from inland waters. Such supplies are quite sufficient in some cases; in others, they may be inadequate or almost negligible.

In a few islands the inhabitants obtain animal protein for their diet from cattle or wild game, but in the great majority such resources are either insufficient or completely lacking. It is, then, understandable that nutrition experts recommend an increase in the animal protein ration of people living in most South Pacific territories. This could well be provided by stepping up fish production, which in any case would be welcomed by most islanders.

Protection Of Resources Essential

Apart from the importance of developing fish production, the protection of marine and inland water resources is a vital matter, since over-fishing is common in the region. While this is usually due to the use of explosives and chemicals for taking fish, in some cases normal fishing methods have been sufficient to deplete the fish population.

The protection provided should cover not only fish but shellfish as well as other aquatic animals and plants. Some shells provide cash incomes besides food, and in such cases protection is doubly necessary.

Possibilities Of Fisheries Development

Among the many possibilities of fisheries development can be mentioned the improvement of fishing gear, and in a few cases, the mechanization of small fishing craft.

Again, in some areas gluts of fish occur occasionally, and there is considerable wastage as preservation of surpluses is not practised. Some solution for avoiding such losses must be found, even if no salt is available or weather conditions are unfavourable.

There are also large surfaces of inland waters in the Pacific region which could, if developed, produce considerable supplies of fish.

Obviously, solutions do not present themselves ready-made, nor can the present status of fisheries in the region be changed overnight. It is necessary, however, to make a start somewhere.

Fisheries Conference To Study Problems

Many administrations in the South Pacific are anxious to develop their fisheries. While some already have qualified fisheries officers in their employ, most have neither fisheries departments nor expert personnel to take care of their marine resources.

It was with the purpose of examining and defining fisheries problems of the region that, in October 1952 the South Pacific Commission convened a fisheries conference at Nouméa.

One recommendation of the conference urged the appointment of a fisheries officer to the Commission.* Another drew the Commission's attention to the usefulness of the courses in technical fisheries instruction held in the Indo-Pacific region with the assistance of the Food and Agricultural Organization.

In June 1955 the Commission approached the FAO for help in organizing a similar course of instruction for the Pacific. The assistance sought was promptly forthcoming, and in October 1955 the Commission gave final approval for the holding of a Pacific fisheries course at its headquarters.

Course To Open In November

The South Pacific Fisheries Training Course is scheduled to open on 19th November next, and will close on or about 24th February 1957.

The Food and Agriculture Organization is assigning a fisheries technologist as co-director of the Course. As well, FAO is providing substantial financial aid, part of the necessary equipment, and will send lecturers.

Assistance has also been promised by the French Administration of New Caledonia, and by the oceanographic staff of the French Institute of Oceania (IFO), Nouméa, *Orsom III*, the oceanographic research vessel of IFO, will, as far as is possible, be made available for field trips.

The Course will be attended by twenty-five trainees from fourteen Pacific territories. Nine lecturers will cover the

* Mr. H. van Pel was appointed Fisheries Officer to the Commission in July, 1954.

wide range of subjects comprising the curriculum. Accommodation and classrooms are being provided at Commission headquarters.

This will be the first fisheries training course held in the region within the scope of the South Pacific Commission. Training centres and seminars have been held under FAO auspices in many countries, but were rather more specialized undertakings designed for trainees already having considerable experience in fisheries matters.

In contrast, this Course is designed to give trainees basic knowledge in fisheries, to pave the way for primary development in the area. Both in content and treatment it relates to conditions prevailing in the South Pacific.

Interpreters equipped for simultaneous interpretation will enable instruction to be given both in English and French. The Course will include theoretical and practical instruction, including field trips.

Trolling off the coast of Netherlands New Guinea from the 70-foot trawler "De Goede Hoop", purchased by the Administration to investigate the fisheries resources of the territory.

Wide Variety Of Subjects

Trainees will be told about the behaviour, habits and habitat of fish; movements of the sea, and influence of wind, currents and sunlight on its living creatures; various items of commercial fishing gear and their operation; elementary navigation; the handling, transport and marketing of fish, and its processing and preservation; the culture of various species of fish and shell-fish; the conservation of marine resources; principles of boat building; maintenance of engines and fishing craft; and, finally, the problems of management in fisheries.

More details will be given in a later issue of the *Bulletin* regarding this new development in the field of fisheries in the South Pacific.

Fisheries Conference Recommendations

At the Fisheries Conference held in Nouméa under Commission auspices in October 1952 the following views and recommendations were recorded. The Conference:

—stressed that in some territories populations were growing so rapidly that to increase fish production was the only way to maintain even existing levels of fish consumption;

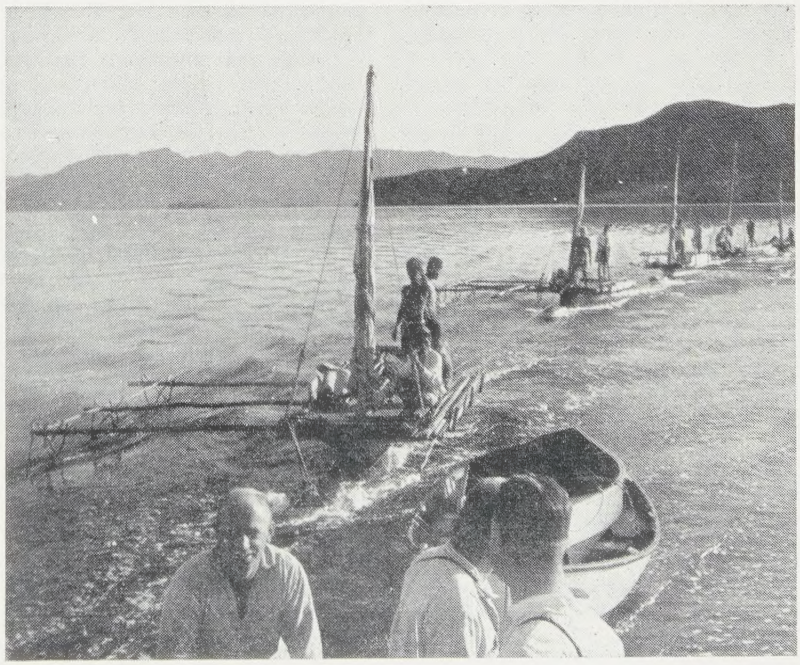
—considered that coral reef and atoll areas, the main source of fish supply in the region, had a definite limit of yield; that mangrove and estuarine areas were abundant and relatively unexplored areas of fish; and that oceanic sources were more extensive, commercially-valuable species such as tuna and mackerel being found in abundance in some areas;

—considered that methods used in the processing, marketing, and distribution of fish in the South Pacific were generally inadequate, even at the existing relatively low levels of consumption;

—recommended the establishment where necessary of territorial fishing services to encourage development of the industry, and requested the Commission to explore the possibility of providing a special course of lectures on fisheries administration for officers recruited within the region;

—recommended that Governments should promote the development of community fishing enterprises, should encourage the use of modern fishing techniques; and should aid fishermen to acquire the necessary powered craft and modern equipment;

—considered that if the appointment by the Commission of a Fisheries Officer to implement its recommendations were approved, his main tasks should be: (i) to co-ordinate fisheries development projects in the various territories, (ii) to study new fishing techniques tested in the region, (iii) to advise member Governments of the Commission regarding their fisheries programmes, and, (iv) to gather and disseminate information currently lacking on the fisheries of the South Pacific.



A cruiser carrying delegates to the Fisheries Conference, towing pirogues to fishing grounds off New Caledonia for a demonstration of native reef fishing methods.

The Rhinoceros Beetle In Western Samoa

A coconut palm in the Utumapu experimental area, about 25 years old and showing typical severe damage. Such a palm will almost certainly die within a few months.

As part of the South Pacific Commission's rhinoceros beetle research project, Dr. R. A. Cumber early in 1954 began a two-years' study of the ecology, damage patterns, and control methods of ORYCTES RHINOCEROS *in Western Samoa. His report embodying his findings and conclusions is shortly to be published in the Commission's Technical Paper series. It is reviewed below . . .*

By C. P. HOYT*

Ecological Studies of the Rhinoceros Beetle, Oryctes Rhinoceros (L.), In Western Samoa, by R. A. Cumber, B.Sc.(N.Z.), Ph.D.(Lond.). South Pacific Commission, Nouméa. 1956.

The coconut rhinoceros beetle, *Oryctes rhinoceros,* is thought to have been accidentally introduced into Western Samoa from Ceylon in a shipment of rubber plants in 1909. Since that time it has caused extensive damage and losses to the copra industry in the Samoan Islands.

The year 1914 found the beetle well established in American Samoa, and in 1931 it became introduced into the Wallis Islands. From another source the beetle was spread to New Britain and the Palau Islands in 1942. Vava'u Island in the Tonga Group reported the presence of the rhinoceros beetle in 1951 and adult beetles were found in the Suva area of Fiji in 1952.

The South Pacific Commission decided in 1953 to undertake an extensive programme aimed at the achievement of maximum control of this pest in the infested islands. Because of the high, stable population of this pest in Western Samoa, the absence of other dynastid beetles in the Islands and the facilities offered by the large plantations of the New Zealand Reparation Estates, it was decided to station an entomologist in Western Samoa for the purpose of conducting a study of the ecology, damage patterns and control methods of *Oryctes rhinoceros* there. Dr. R. A. Cumber undertook these studies at the beginning of 1954 and completed his work two years later. His report, *Ecological Studies of the Rhinoceros Beetle* Oryctes rhinoceros (L.) *in Western Samoa,* being published by the South Pacific Commission as a Technical Paper, records his findings and conclusions resulting from this project.

The report is divided into seven sections. The first four are concerned with the ecology of the adults and larvae of the rhinoceros beetle, methods used to determine population estimates of the adults, descriptions of the areas in which the work was carried out, and notes on natural enemies encountered. Section five contains a discussion of the factors which operate to influence rises in beetle population density or outbreaks which occur in towns, plantations and forest areas. Section six is devoted to the conclusions reached from this study and suggestions of control measures, with special reference to cultural and hygienic practices to reduce the populations of beetles and hence the damage to the coconut plantations in Western Samoa. Section seven is an addendum outlining the work undertaken by Dr. Cumber in the testing and liberating of biological control agents received during his stay in Samoa.

Investigations Under Field Conditions

The investigations on the ecology of the rhinoceros beetle were conducted under field conditions in Western Samoa. Much of the work was done on the plantations of the New Zealand Reparation Estates, so that while the conditions described and the conclusions reached are in general applicable in the widest sense, they are particularly of value in reference to the estate type of plantation found in Samoa.

For many years the managers of the New Zealand Reparation Estates in Western Samoa have used a system of log traps around the margins of the coconut plantations in an attempt to control the rhinoceros beetle. These traps are described by Dr. Cumber as being constructed from coconut log sections, cut to four feet in length and then split in half. Ten to twelve of these halves are laid flat on the ground and comprise a trap.

Observations involving the use of some two hundred of these traps enabled Dr. Cumber to determine many aspects of the life of the adult beetle in the field which were previously unknown. By releasing large numbers of marked beetles and using these same traps, estimations of the total population of

* Dr. Hoyt is Plant and Animal Quarantine Officer to the South Pacific Commission.

Severely-damaged palms on the inland margin of the Vaipoto plantation.

Routine search of a typical log-trap in the Utumapu experimental area.

adult beetles in a given area were made by comparing the numbers of marked beetles recovered with the numbers of unmarked beetles taken over a given period of time.

Important Data Obtained

Data of great importance to workers faced with the problems of eradication or control in newly-infested areas were obtained on the ranging and dispersal habits of the adult beetles. Dr. Cumber recorded dispersals within a plantation of as much as one thousand yards in three days' time, and a recovery in another plantation one mile from the release point after a period of one month. Further experiments with marked beetles showed that adult beetles lived in the field for periods as long as 140 days, this particular record being that of a male beetle.

In the case of the plantation area investigated, the population of adult beetles was determined to be approximately two per coconut palm. However, since it was found that the beetles tended to congregate on the open margins, presumably to avoid such mechanical obstacles as hedge trees and even the closely-spaced palms of the centre of the plantation, the number of beetles per palm on these margins actually reached as high as six. Under this concentration of beetles the marginal palms were being killed by the continuous feeding of the beetles in the growing tissus of the plant.

Important breeding materials occurring in Samoa which serve as sources of rhinoceros beetles were found to be in order of importance, stumps of coconut palms left following the practice of cutting the tree off about four feet from ground level, the coconut logs from felled palms which are allowed to rot on the ground, and the dead wood of many species of forest trees resulting from clearing of jungle land. In the vicinity of towns, sources of considerable importance were found to be city rubbish dumps and piles of sawdust in the vicinity of lumber mills.

Under Section V—Discussion—the factors reported in the previous sections are taken into consideration in explaining the damage found in both estate and native plantations and in towns.

In the case of the estate type of plantation, several factors are considered by Dr. Cumber as being responsible for the severe inroads made by the beetle. He considers that in widely-spaced plantations the death of a few palms greatly increases the margins which provide the main channel of entry for beetle attack. In addition, the practice of cutting down the palm instead of uprooting it, leaves stumps and also dead trunk wood on the plantations and thereby provides ideal breeding material for the beetle Grazing by cattle of plantation lands removes the undergrowth which would otherwise cover this dead wood, and this is considered to increase greatly the chances of the beetle locating its preferred breeding material.

Other factors of importance in some localities are the conversion of coconut plantations to growing cocoa. The remaining coconut palms soon die or are cut down and the resulting dead wood starts to breed beetles. These attack neighbouring plantations and soon are able to kill some of the marginal palms and produce thereby their own breeding material.

Where plantations have their margins close to towns, refuse dumps and sawdust accumulations are able to provide the necessary initial sources of beetles which then attack the plantation margins and proceed thereafter in much the same fashion as in the case of adjoining cocoa developments. In addition to producing beetles which damage adjacent plantation areas, town breeding areas constitute a serious threat to quarantine measures.

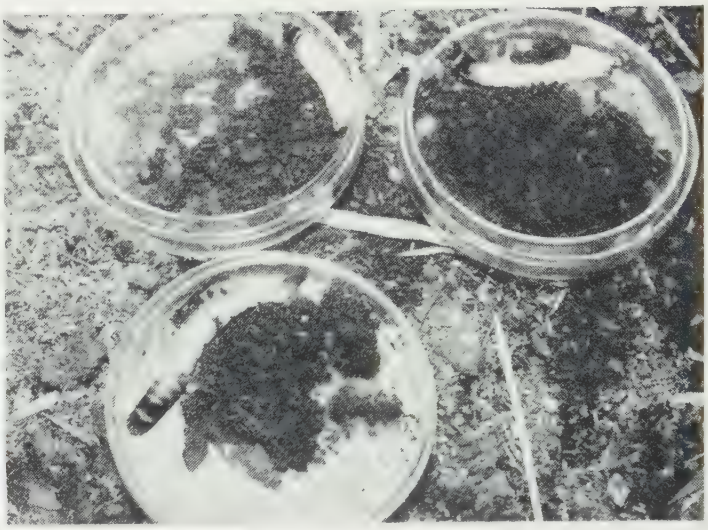
Clean Plantations Essential To Control

Once the habits and the sources of a pest are understood, control measures often are able to be instigated. Biological control is of course the ideal solution, especially for a pest of this type, but there are no guarantees that any suitable agent or agents for this will be forthcoming.

However, even if control agents are found, it will still be necessary to keep the plantations themselves free from masses of breeding material if full advantage is to be taken of the reduction of the beetle population. As the jungle provides a reservoir for beetles, plantation areas adjacent to the jungle should be protected by a margin of closely-planted coconut palms, renewed whenever necessary, and this area is considered one which might be profitably trapped by the use of the split log traps described previously.

To take advantage of the lesser degree of attack to closely-spaced palms which is thought to be due to a dilution of the beetle population expressed in beetles per palm, it is recommended that the coconut-growing areas be consolidated, and replanted with a closer spacing between the palms, in addition to the carrying out of a general elimination of the beetles' breeding places.

During the course of the study two species of bacteria, *Bacillus lentimorbus* var. *australis* and *Bacillus eulomarahae* were discovered and sent to Dr. Cumber by Dr. R. L. Beard. These were tried against the larvae of *Oryctes rhinoceros* with indifferent results. Observations were made on the occurrence and possible effects of green muscardine fungus, *Metarrhyzium anisopliae*, which has been recorded elsewhere as being pathogenic



Above: Dr. Cumber and assistant liberating the larvae of Agrypnus fuscipes Fabr. and Alaus speciosus Linn. in a compost pit in Western Samoa. Right: the larvae of Agrypnus fuscipes Fabr.

to the larvae of the rhinoceros beetle and also on the introduced Scolid wasp, *Scolia ruficornis*. Two elaterid predatory beetles were sent to Dr. Cumber from Ceylon, and these were released by him in Western Samoa. The beetles, *Agrypnus fuscipes* and *Alaus speciosus*, were found to attack *Oryctes* larvae in coconut logs in Ceylon and were collected and shipped by Mr. T. V. Venkatraman, who is employed by the South Pacific Commission to search for predators and parasites of the rhinoceros beetle in the Indian and African areas.

In the summary of the work done, the facts found and the conclusions and recommendations drawn from these, led Dr. Cumber to put forward two points which in the opinion of the reviewer will not suffer by their repetition. These are:

"It should be clearly understood that research does not guarantee an easy solution to the problem. Any measure which reduces beetle populations a fraction is a useful one, and it is hoped that biological control agents may effect some further measure of control as they already undoubtedly do in Samoa at present."

The author continues:

"The future of the copra industry in Western Samoa depends upon the industry of the people. If plantations are kept clean, and there is replanting on a wide scale to consolidate plantations, then the future of the industry is assured."

The truth of these statements is obvious, yet they are both too often ignored.

NOTE: The illustrations accompanying this review are from Dr. Cumber's report.

New Zealand Educationist Joins Commission

ON September 7th Dr. Richard Seddon, M.A., Ph.D. (Lond.), arrived in Nouméa to take up appointment with the South Pacific Commission as Executive Officer for Social Development. He was accompanied by Mrs. Seddon.

Since 1950 Dr. Seddon has been senior lecturer in education at the University of Otago in Dunedin, New Zealand, with special responsibilities in educational psychology.

He has been active in many social and community projects. He was President of the Dunedin Nursery Play Centres' Association and Visiting Lecturer to the Free Kindergarten Association and the New Zealand Plunket Society. He is a foundation committee member of the New Zealand Society on Alcoholism.

Dr. Seddon succeeds Mr. H. E. Maude, O.B.E., who resigned last December after seven years as head of the Commission's social development section.

Dr. Richard Seddon.

WHO Pacific Representative Appointed

DR. J. M. Cruikshank, until recently Director of Medical Services, Fiji, and Inspector-General of the South Pacific Health Service, has been appointed area representative of the World Health Organisation for Australia and New Zealand, and the South Pacific island territories of Australia, New Zealand, the United Kingdom, France, the United States and the Netherlands. His headquarters will be at Sydney.

The function of WHO area representatives is to facilitate contacts with governments and representatives of other organisations with responsibilities in the area.

It is hoped by the World Health Organisation that Dr. Cruikshank's appointment will lead to a greater use of experts from and training facilities in Australia and New Zealand, closer co-operation with the South Pacific Commission, and greater activities in the island territories, with emphasis on the combined control of endemo-epidemic diseases rather than individual disease campaigns, and better environmental sanitation and maternal and child health.

Harvesting cocoa pods on Awala Plantation in the Kokoda district in Papua. Cocoa production in Papua and New Guinea has greatly increased in recent years.

Cocoa Planting For The Neophyte

By D. R. A. EDEN*

WHEN the price of cocoa beans rose to the unprecedented level of £500 per ton sterling in 1953-54, great interest was stimulated in production of this crop. Many people without previous tropical experience acquired properties throughout the South Pacific region for the purpose of growing cocoa.

Many of those who became interested lacked any previous knowledge of this exacting crop. Frequent requests have been received for information in broad outline on what should or should not be done when setting out to establish a cocoa plantation. This article is especially written for the neophyte in cocoa husbandry.

It is inadvisable for the beginner to plant cocoa in a territory where established plantations do not already exist. Only certain tropical conditions of climate and soil combine to promote optimum yields from cocoa. In a number of tropical islands the tree cannot be profitably husbanded because of the risk of high winds, while in other localities the soil is entirely unsuitable for its cultivation. It is best therefore for the beginner to choose land in some locality where the crop has already been successfully and economically grown, where valuable information may be gathered from neighbouring estates, and where the general practices obtaining may be followed. In this way the new planter may avoid many mistakes which can often be made through lack of local "know how".

Study Of Textbooks Recommended

The careful study of reliable text books on the subject of cocoa growing is essential, though caution is urged in adopting practices recommended in foreign cocoa-growing countries without comparison with local procedures endorsed over the years by trial and error. On certain phases of cocoa cultivation it is difficult to write a text book which may be found universally acceptable. What may become successful common practice in one country may not always be applicable in another.

For instance, the question of overhead shade. Wherever cocoa is grown in clay silt soils, large leguminous trees are to be found interplanted between the rows of cocoa, ostensibly as shade, but actually to mop up, in the rainy season, excessive water suspended in the clay soil. Cocoa will not thrive in a bog. On the other hand, in the sandy loams or laterite soils of some of the Pacific islands the interplanting of shade trees is almost entirely—in some cases entirely—dispensed with. The latter types of soil are very porous, and rain water drains away so rapidly that moisture conservation is most important. In such soil intense competition for water with large trees, particularly in the dry season, would be disastrous to the cocoa. Overhead shade is thus a happy solution to a problem in one country, but is undesirable in another.

Twenty degrees of latitude above and below the equator is the generally-accepted maximum range of the world's cocoa belt. Rainfall, however, is most important, and to provide ideal conditions the average annual precipitation should not be less than eighty inches and not more than one hundred and twenty inches. The temperature should average around 84 degrees Fahrenheit, while humidity should be high, both in the daytime and at night.

An experienced planter will seldom choose land for cocoa-growing above an altitude of 500 feet above sea level. In tropical islands with high lands and rain forest growth, precipitation in the wet season inclines to be excessive and continuous above 500 feet. Since the main harvest ripens in the wet season, continuous rain at that period promotes ideal conditions for the spread of black pod, one of the most serious fungus diseases of cocoa. This scourge is always present to some extent on any estate, but if rain continues for many days on end, black pod can account for the destruction of from 25 to 75 per cent. of the total crop. Planting below the 500-foot level will not ensure freedom from black pod, but it will tend to minimise the danger and limit its ravages.

When a young estate comes into bearing, the planter should be careful to see

* Mr. Eden, a leading authority on cacao cultivation in the Pacific, was General Manager of the New Zealand Reparation Estates in Western Samoa from 1935 until his retirement early this year. Next to copra, cocoa is the main crop grown on the Estates.

that all pods infected with the disease are removed from the trees. The spores of the fungus can be carried either by wind or raindrops to neighbouring healthy pods. Old, withered black pods which in neglected estates festoon the upper branches of the trees are a menace to succeeding crops. Except for constant spraying with Bordeaux mixture, which is a most expensive practice, the routine removal of all infected pods is the only known safeguard against the disease.

The spacing of cocoa trees is a subject often debated among cocoa planters. Distances between trees range from around six feet in Africa to from twelve to sixteen feet apart on more scientifically-planned estates elsewhere. Ideal spacing, of course, depends upon the size attained by the variety of the cocoa grown, and by the standard of soil fertility in which it is grown. For the large Java hybrid, which is fairly extensively cultivated throughout the Pacific region, sixteen feet by sixteen feet has been found to be the maximum spacing necessary, and twelve by twelve the minimum advisable.

In clearing tropical bush, where the forest trees rot rapidly after they have been felled, it is common practice to lop all branches except those which are parallel with and lie close to the ground. This gives the planter a clear view when lining out the cocoa rows. Burning, apart from being very difficult under rain forest conditions, is unnecessary, because little remains of the fallen giants after two years. It would be bad practice to burn when so much valuable humus is readily available through the simple process of allowing timber to rot back into the soil.

Line out with a long length of thin steel wire, marked off by spots of solder, twelve, fourteen or sixteen feet apart, whichever spacing has been decided upon.

Establish the base line first (by placing pegs at each solder spot on the tape) on the widest boundary of the field to be planted. Peg out similar lines at right-angles to the base.

Use fairly long, straight pegs cut from the branches of bush trees. If the planting is sixteen by sixteen, square pattern, one hundred and seventy pegs will be required for every acre to be planted. The pegs mark the centres of the holes to be dug where the cocoa will be planted. The pegs should be perpendicular when they are thrust into the soil because this simplifies the lining. Once a line of pegs is in position, a check should be taken by eye to see that the line is perfectly straight. As the measuring process proceeds, check also the diagonals to ensure that the planting pattern is correct.

When digging the holes, leave the marking pegs in position until the outline of the hole is clearly delineated. The holes should be two feet by two feet wide and eighteen inches deep. All the soil should be removed and left exposed to the sun and air for two or three days. When replacing the soil, add fertilizer consisting of a mixture known as 3-2-1. This consists of superphosphate, sulphate of ammonia and sulphate of potash in proportions of three, two and one by weight. A cigarette tin full of the mixture is the maximum quantity which should be used in each hole, and this should be well mixed with all the soil as the latter is replaced.

Plant three seeds about three inches apart in each prepared hole or seed bed. Use seed taken freshly from fully-ripe pods from selected high-yielding trees.

Selecting The Parent Tree

The parent tree should be free from disease and carry large pods containing not less than forty well-formed cocoa beans. The ideal weight of the total green beans in each pod should be seven ounces for a Java Criollo/Forastero hybrid, but most planters are well satisfied with six ounces of green cocoa beans to the pod.

The parent should yield at least 120 pods annually. Count the pods carried by a heavily-laden tree in the November peak harvest, and allow twenty-five per cent. more for the second crop. This will give the approximate number of pods a tree will carry annually.

Be careful to avoid taking seed from a tree which carries numbers of pods infected with black pod. Just as certain trees have been found with a marked resistance to the disease, so conversely planters have found that certain trees carry unusual numbers of infected pods regularly. It would be obviously foolish to multiply such a characteristic by planting seed from such a parent.

If a tree can be found which is not only a high-yielding tree, but is also notable for its general freedom from black pod, the new planter will have found a very desirable parent tree. It should be pointed out, however, that by planting from seed as opposed to vegetative propagation, there can be no guarantee that the resultant progeny will resemble the parent tree in every particular. If the tree is a hybrid some of its progeny may throw back to an early form. All sorts of variations are possible, but the planter can be assured that the general average of trees grown from selected seed will be appreciably better than those grown from seed haphazardly gathered.

Three seeds are planted in each hole to allow for selection when the seedlings are about eighteen months old. Plant the seed just below the ground surface and erect some form of shade over each hole immediately after planting. Woven baskets are commonly used for the purpose, or small stone cairns are built around the area where the seed is planted; these are sometimes shaded on top with sticks about the size of a thumb, laid diagonally across the diameter of the stone cairn.

When around eighteen months old the best of the three seedlings should be selected and the other two removed. Care should be exercised in selecting the seedling to be left. It should be straight-growing, healthy and heavy in trunk by comparison with its fellows.

Reject all seedlings with a plume of feather-like but stunted leaves at the peak of growth. This generally signifies halted growth through poor root development. The small ramifications at the top of the seedlings should be well defined and show a head of three or four small branches. If a greater number show in a selected seedling, clip out any number exceeding four.

Do not pull out the rejected seedlings. This will disturb the root system of the one to be left. Cut off the rejects close to the ground with a pair of pruning secateurs.

After planting the cocoa put in legumes in parallel lines between the rows of cocoa. They serve as a green manure and, as they grow, shade for the young cocoa.

There are many legumes suitable for this purpose, but none is more compatible with cocoa than 'dadup" (*Erythrina lithosperma*). If allowed to grow, this legume will attain a height of between thirty and forty feet; on the other hand, by regular lopping with bush knives, it can be steadily maintained at waist height, if overhead shade is not required.

In the early stages of making a plantation, great numbers of legumes may be planted. They develop upon their roots small potato-like growths called nodules; these give off a carbohydrate exudate. This in turn attracts a type of useful bacteria which release nitrogen into the soil, benefiting not only the legume itself but the surrounding interplanted cocoa as well. If the legumes are lopped regularly the cuttings should be allowed to remain where they fall and rot back into the soil and provide a continuous source of humus.

Lastly, the shade produced by the legume restricts the growth of weeds and reduces plantation costs accordingly.

When the cocoa is three years old particular attention should be given to shaping the young tree. Pruning is commenced in February, when the main harvest is concluded, and should be concluded by May. Later pruning is inclined to shock the tree when it is carrying the cherelles of the new crop.

Shape the trees to have three, or a maximum of four, leaders. The leaders, or main branches, should be evenly spaced, and each individual limb should rise at an angle of about forty-five degrees from the trunk. It is safer to avoid having leaders which tend to the horizontal. They are usually weak when mature, and the weight of a good crop of cocoa may break the branch, and even

Above: New cacao clones received from Trinidad via Kew Gardens, London, by the Naduruloulou Introduction Garden in Fiji.
Right: Some years ago a selected cacao tree on Lafi Station of the New Zealand Reparation Estates, Western Samoa, proved to possess exceptional merit, both as to yield and to resistance to black pod disease. This tree, known as "Lafi 7", is the foundation parent of many thousands of identical trees grown by a system of vegetative propagation. This photograph shows a "Lafi 7" seedling tree at Naduruloulou commencing to flower at 2½ years of age.

split the tree trunk.

In shaping a young tree, where a limb is found to be growing horizontally, cut it back to about a foot from the trunk. A healthy tree will soon send out a water-shoot, and a new branch with a more classic angle can be formed from the shoot.

Water-shoots are fast-growing, fleshy, pink and green shoots which appear on the stem and branches of the cocoa trees in flushes, generally in sunny weather after heavy rains. By the use of water-shoots, misshapen trees can be re-formed, and if a diseased limb has to be removed, a water-shoot can often be used to replace it.

In Surinam a method was evolved where water-shoots were allowed to grow from the lower trunk of a cocoa tree. A strong one was selected to grow concurrently with the parent. When the water-shoot grew to maturity the parent stem was sawn off, and the new tree took over its functions.

The theory behind this is that the bark of an aged tree is often diseased or infected with dry rot. As a result many of its flower cushions will have been destroyed and its yield lowered. Replacement by a water-shoot makes a new, healthy tree on the old rooting system.

Expert opinion, however, suggests that it is better practice to grow a seedling alongside an old tree, and when the seedling is ready to bear, to remove the old one altogether. It has been proved that a new rooting system is just as important for high yield as new bark.

On a mature estate, unless reserved for some specific purpose, water-shoots are removed regularly to ensure that the crop, as it matures from the flowers to the ripe fruit, will have the benefit of all the available plant nutrients that the sap stream provides.

The ideal shape for a cocoa tree is that of an umbrella. The leaders and secondary branches represent ribs and the canopy of leaves the umbrella cover. The textbook version of how clear a cocoa tree should be pruned below the canopy is that the branches in the lower structure of the tree should be sufficiently well-spaced for a bird to fly through without touching its wings. (How large the trained bird is supposed to be has never been stated.)

Prune the canopy annually to give at midday a checkered pattern of half-sun and half-shade on the ground below the tree.

The weeding of a cocoa plantation is the most expensive item on the maintenance schedule. It is generally agreed that the best practice, and the most economical, is black weeding—that is, all weeds and grass are removed regularly.

It is the dream of many planters to grow cocoa where mechanical agricultural implements can be used, as opposed to hand weeding. In volcanic soils where cocoa thrives the use of mechanical cultivators is very often impossible owing to the stony nature of the terrain. Cultivation by machinery is not possible anyway if the felled timber is not removed before the cocoa is planted.

On estates where hand weeding is imperative, strip or line weeding along the rows of cocoa and legumes is the cheapest form of weeding. Increase the width of the strips each month until the block is entirely black weeded. When the bush is first felled, few noxious weeds and very little grass exist. Continuous weeding each month thereafter eliminates seeding, and the weeders' task remains an easy one.

A clean plantation minimises the risk of rat epidemics, as the rodents live and breed among tall weeds and heavy grass. Competition with weeds for moisture in the dry season not only affects the cocoa crop adversely, but ultimately the health of the tree. The dank humid conditions promoted by weeds in the wet season stimulate the germination of black pod spores. The free circulation of air beneath the cocoa trees is essential to their well-being, and this is prevented by weedy growths.

Lastly, the valuable contribution to organic matter in the soil, which is given by the rotting of fallen cocoa leaves, is negatived when the soil is covered by weeds or grass.

In conclusion, it is stressed that the new planter should regard his cocoa plantation as an orchard. Cultivation or weeding, annual pruning, disease control and the application of fertilizers when necessary are essential factors for successful results from orchards and cocoa plantations alike. Each tree requires individual attention, and the most profitable blocks upon any estate are always those which have had the greatest care and attention expended upon them.

From Subsistence Gardening To Cash Crops

The development of cash crops in the South Pacific from the early days, and the major part they play today in the economy of the region, are discussed in this article by . . .

J. BARRAU and H. S. McKEE*

Experiments are being carried out to improve the varieties of taro grown in New Guinea. Here agricultural officers inspect an experimental plot at Keravat, near Rabaul.

THE first Europeans to visit the south seas were members of exploring expeditions sent out to discover new routes to Asia or in search of the great southern continent supposed to exist in the Pacific.

The first voyagers were Spaniards, who in the 16th and 17th centuries sought lands rich in gold and new fields for missionary work to convert pagan peoples to Christianity. Dutch ships supported by the East India Company made early visits to several of the island groups of the South Pacific, but formed no permanent contacts with them. The navies of France and Britain fitted out well-equipped scientific expeditions in the 18th century, such as those of Bougainville and Cook. Finally, at the end of the 18th and throughout the 19th century, missionaries, mainly from Britain and France, established permanent posts in almost all parts of the Pacific. Their work and their rivalries are closely inter-woven with the complicated events leading to the present pattern of territories in the Islands.

The activities of the explorers and missionaries are known to all who have any interest in the history of the Pacific. The part played by Europeans who came to the Islands for commercial reasons is sometimes less fully realised. These men often left little record of their travels, and many indeed had good reasons for keeping their activities as secret as possible. We know, however, that in many areas they followed closely behind the explorers.

Whalers, sandalwood and trepang traders, and the infamous black-birders often preceded the missionaries. The first thought of these trade-minded white men was to find products which could be exported for cash. Sandalwood and trepang for the Chinese market were staple items in the early trade.

Other exports were surprising in view of the present direction of trade in the Islands. Orange trees planted in Tahiti by Captain Cook spread rapidly, and until pests and diseases largely destroyed the plantations, oranges were exported from Tahiti to California. There was a time, too, when pork from pigs raised in Tahiti was exported to Australia. Even the forests of the island were not spared, and Tahitian timber was exported to South America. Yams were exported from Fiji to California, New South Wales and New Zealand.

Many other examples could be found in the South Pacific of exports which no longer figure in the trade returns.

Some of the local food plants offered commercial possibilities. The people of Fiji and the Polynesian islands knew how to produce starch from the tubers of arrowroot (*Tacca leontopetaloides*), and this was among the first foodstuffs exported from the Islands. The coconut palm was present everywhere, and its nuts were a common food. The islanders were also able to extract oil from the meat of the coconut, thus producing another product which could be exported.

Early records mention that between 1850 and 1860 an Englishman produced coconut oil commercially on a small islet off the West Coast of New Caledonia. He used the old Polynesian method, placing old native canoes filled with grated coconut meat on the white coral beach. Fermentation and the heat of the sun freed the oil, which collected in the bilges. Oil produced in this way was exported for a time from many islands, but later it was found that copra, more convenient in handling though bulkier than oil, was more suitable for export.

The production and export of copra still dominates the economy of most territories in the Pacific. There is today a tendency towards the export of oil produced by modern factories similar to those handling copra in the importing countries, but copra is still the main coconut product shipped from most of the Islands.

Copra and arrowroot are derived from traditional food plants. The first cash crops came from produce not needed at the time of sale, but originally intended for use as food. Later, special plantings were made to increase the amount of produce available for sale. Finally, cash crops from other parts of the world were planted. These were mostly food plants, but they were not always used as such by the people who grew them, the whole output often being sold.

Era Of Plant Introductions

The era of intensive plant introduction which began with European settlement and missionary activities saw the importation of many cash crops. Keeping Tahiti as an example, vanilla was introduced there in 1846, cocoa in 1848 and coffee in 1860. In New Caledonia, coffee was first planted in 1866, vanilla about 1860, and black pepper in 1862. Few of these early introductions became important crops except for vanilla in Tahiti (particularly in the adjacent islands), and coffee in New Caledonia.

The first large development of cash crops was in European coconut plantations in the Western Pacific. Extensive planting began about 1880 and continued

* Mr. Barrau is Subsistence Agriculture Officer, and Dr. McKee, Food Technologist, to the South Pacific Commission.

The development of fibre-producing plants as possible supplementary cash crops is being investigated in Papua and New Guinea. Left: A three-year-old sisal crop growing at the Bubia Agricultural Station, Lae. On the right, sisal is being hung out to dry after passing through a decortication machine.

until the outbreak of war in 1914. The methodical Germans were particularly active, and impressive results of their work may still be seen in New Britain, New Guinea, New Ireland, Bougainville and Western Samoa.

During the same period British and French interests also developed large plantations in the Solomons and the New Hebrides. Coconut plantations were also important in Tonga and in parts of Fiji (Vanua Levu and the Lau Group). In Fiji the growing of sugar cane, mainly by immigrant Indian farmers, became an important rural activity, and is today a feature of the landscape in Viti Levu and Vanua Levu, the only islands in the South Pacific where sugar cane has survived as an industrial crop.

Conditions in New Caledonia were somewhat different, as European settlement there was based on small agricultural holdings and on large cattle-raising estates. The French settlers tried a great variety of different crops, including rubber, cotton, vanilla, sugar cane and coffee, to mention only a few examples. Some of these met with temporary success. During the last century enough sugar cane was produced to keep four rum factories running, but the industry has now disappeared. Cotton, too, was important for a time, but production ceased before the last war. Only coffee survived; it is still the main agricultural export from New Caledonia, though somewhat overshadowed by exports of metals and ores. Mining is relatively more important in New Caledonia than anywhere else in the Pacific (except the phosphate islands such as Ocean, Nauru and Makatea), and dominates the economy of the island.

In eastern Polynesia and in Micronesia there were some European plantations, but they were less important than in the western groups. It may be noted that in the high islands of western Micronesia, Japanese settlement played a notable part in the development of cash crops.

For many years European enterprise provided the whole—or a great part—of the produce exported from the islands with large plantations. Gradually, however, the islanders took a larger part in the production of export crops.

In New Caledonia, natives employed as labour by European farmers learned how to grow and process coffee, and soon started to plant a few coffee trees in their villages. Later, when the Administration encouraged the planting of coffee in the villages, success was immediate. Coffee produced by European growers accounted for the greater part of exports up to the war, but the situation has now changed. Native coffee plantations are still expanding, and today the islanders are the main producers. In some islands of south-east Polynesia coffee-growing is under consideration as a means of improving economic conditions. Before the war most of the copra exported from the New Hebrides came from European plantations, but today 50% to 60% of the export crop is produced by the islanders. A similar development has occurred in the British Solomon Islands.

In New Britain and New Ireland native production of copra and cocoa, already large, is steadily increasing, and similar trends may be seen in various parts of the mainland of New Guinea and in Bougainville. The production of cocoa in the villages of Western Samoa plays an appreciable part today in the economy of that territory; cocoa production by the people of the New Hebrides is small at present, but increasing.

Growing Of Cash Crops Encouraged

The encouragement of native cash crops is a feature of agricultural development policies throughout the South Pacific. In many territories the bulk of exports comes already from native producers, and everywhere their proportion of the total production is tending to increase. In some territories the output of European plantations is less than before the war, but increased output by the islanders has maintained or even increased the total available for export. Increased output still seems desirable, as it is unlikely the very high prices which prevailed for tropical products during the years after the war will continue indefinitely. To maintain the present income from exports, larger crops may be needed to compensate for lower average prices.

During the period of trial and error in the early phase of European settlement, many crops were tested. Some flourished for a time, as, for instance, cotton in Fiji and in New Caledonia, but later lost their markets. Others, like coffee and cocoa in the New Hebrides, have had a period of decline from which they may yet emerge. Some have become specialities of particular areas, for instance, vanilla in Moorea, Huahine and Raiatea in French Oceania. Islands with good shipping connections to New Zealand, and no economic barriers, have an outlet for fruit. Fiji, Western Samoa, Tonga and Niue ship bananas to this market, and the Cook Islands, citrus and tomatoes. Sugar cane is important

(Continued on page 48)

Jars of nam pla, or fish sauce, ready for transport. Thailand.

Concrete troughs for making nam pla, a salty, protein-rich liquid.

Fish Sauces And Pastes Are Palatable And Nourishing

Popular in South East Asia for flavouring monotonous diets based on rice, fish sauces and pastes offer a simple way of reinforcing protein-deficient diets such as are often found in the South Pacific. Their manufacture, which is simple, provides an excellent way of utilising supplies of fish that otherwise would be wasted. How they are made is described in the article below.

By H. S. McKEE*

FISH sauces are widely used in South-East Asia, being known as *nuoc-mam* in Indo-China, *nam-pla* in Thailand and *patis* in the Philippines. They have long been valued as condiments for improving the flavour of monotonous diets based on rice, and are also considered nourishing by the peoples of these regions.

Their nutritive value is confirmed by chemical analysis, which shows them to contain useful amounts of amino-acids. These compounds are the units from which protein, the main material forming the muscles and organs of the human body, is built. The body can make its own proteins from amino-acids produced by digestion of proteins supplied in the diet, but for efficient use these amino-acids must be present in the right proportions. Rice and other cereals contain proteins which are relatively deficient in the amino-acids lysine and tryptophane, and are therefore used much better if other foods correct these deficiencies.

Fish is rich in lysine, and is thus an excellent supplement, even in small amounts, to a mainly cereal diet. The preparation of fish sauces is likely to retain the lysine and other valuable amino-acids of the fish. Analyses made at the 'Institut Pasteur', Saigon, have shown that *nuoc-mam* contains tryptophane, lysine and many other amino-acids.

Fish sauces also add vitamin B_{12} to the diet. The human requirement for this important vitamin is very small, but if it is not satisfied the blood-forming process is disturbed and a serious anaemia results. It is absent from rice and from most other plant products, though its presence has been reported in leguminous pulses. *Nuoc-mam* from Indo-china has been analysed for vitamin B_{12} in recent years, the samples analysed being made from several different sorts of fish. The content of vitamin B_{12} varied considerably according to the species of fish used, but all samples were good sources of the vitamin. The amino-acids and vitamin B_{12} of fish sauces can fill serious gaps in the nutritive value of diets consisting mainly of rice. These sauces also supply essential minerals, especially calcium and phosphorus. The contribution of fish sauces to the diet is only limited by their high salt content, which causes them to be mixed with large amounts of other foods.

Preparation of Fish Sauces

The manufacture of fish sauces offers a valuable outlet for fish which may be difficult to use in other ways. Fish is often wasted in important fishing areas, either because of gluts when the catch exceeds the capacity of the local market or because the fish caught is unacceptable for direct human consumption. Some fish are avoided by consumers for traditional reasons or because they are considered unpalatable; others are too small and bony to be used.

* Dr. McKee is Food Technologist to the South Pacific Commission.

The utilization of such fish poses difficult problems. It can be converted into fish meal, a product used mainly as fertilizer or as stock food rather than for human consumption. The large-scale manufacture of fish meal also needs complex and expensive equipment, which can only be used profitably if regular supplies of fish are available for a large part of the year. For similar reasons canning and the manufacture of fish oils require steady supplies of fish, and are of little use in handling sudden gluts.

Drying in the sun involves less equipment than the methods already mentioned, but is in many regions hindered by weather conditions for part or all of the year. Small-scale artificial drying of cooked fish is practicable, but the product requires moisture-proof containers, preferably metal, if it is to be kept for more than a few weeks in warm damp climates. Mr. H. van Pel, fisheries officer of the South Pacific Commission, has recently shown that dried fish flakes of good quality can be made from cooked fish by very simple means.

The manufacture of fish sauces from sea or fresh-water fish requires only simple equipment and can, if necessary, handle large amounts of raw material at a time. The essential piece of equipment is a vat in which the salted fish is left to be reduced by bacteria and by its own digestive ferments to a semi-liquid state. On the domestic scale, earthenware jars of a few gallons capacity (20 to 50 litres) can be used. Commercial production in Indochina uses wooden vats which hold up to about 1,000 gallons (5 cubic metres) and the National Institute of Fisheries Research of Cambodia (*Institut National des Recherches Piscicoles au Cambodge*) has used reinforced concrete vats with a capacity of 3,300 gallons (15 cubic metres). Concrete vats must be coated internally with some salt-resistant material.

The salted fish is put whole in the vats; it is neither cleaned nor scaled. Very little labour is therefore needed, the main operation being transport between the fishing vessel and the vat. The fish remains untouched in the vat for several months; the solid residue is then washed with brine to extract breakdown products of protein, and other substances of nutritive value. The residue (*nuoc-xat*) can be used as a fertilizer. The washing can be done with a motor-driven pump made of a salt-resistant alloy.

The capacity of a fish sauce plant is limited only by the size of the vats. It can therefore receive its raw material in large batches, even taking a year's requirements in a few days. Fish to which one-fifth of its weight of salt has been added soon after catching can be held for several days before going into the vats. Fish sauces, if correctly prepared, keep for several years; they are more stable than any other fish product except canned fish.

Fermented Fish Pastes in S.E. Asia

These products include *bagoong* in the Philippines, *prahoc* in Indo-China and *trassi* in Indonesia. They are widely used as condiments for rice. The quantities eaten in a single meal are rather small, but taken regularly they must help to supplement the rice diet in essential amino-acids, together with calcium, phosphorus and other minerals.

Bagoong is made from small fish, intimately mixed with one part of salt to three parts of fish, or two parts of salt to seven parts of fish. The salted fish is left undisturbed for three months in earthenware jars and is then ready for use. The *bagoong* contains about 32% of solids; half of this is protein or amino-acids, the rest being largely salt.

The manufacture of *prahoc* is more complicated. The heads are cut off the fish, which is cleaned and scaled before being mixed with coarse salt (one part of salt to five parts of fish). The salted fish is put on mats to dry in the sun for two days. The sun-dried material is then pounded to a paste in wooden mortars. The paste is put in earthenware jars, which are not sealed but are covered to keep out flies, and are exposed in the sun. The paste remains in the jars for a month or more. During this time a salty liquid separates from the paste, and is used as *nuoc-mam*. The *prahoc* is considered to be ready for use when no more liquid appears.

The main centre for the manufacture of *trassi* in Indonesia is the fishing port of Bagan Si Api Api on the east coast of Sumatra, from which substantial quantities are exported to Java.

Trassi can be made either from fish (*trassi ikan*) or from small shrimps (*trassi udang*). The fish is salted (one part of salt to ten parts of fish) in the boats and is spread out to dry in the sun for a few days when they return to port; it usually has at this stage a very strong unpleasant smell which disappears later. The sun-dried material is pounded into a paste, often with the addition of more salt. The process of making *trassi* from shrimps at Bagan Si Api Api is generally similar to that used with fish. Indonesian *trassi* is usually bright red; the colour is due to synthetic dyes. The final product is often mixed with spices. Tapioca (cassava) flour may also be added.

Small red shrimps are used in the preparation of *trassi udang* in the Merauke District on the south coast of Netherlands New Guinea. Production reached 269,000 kg. (263 long tons) in 1949, a considerable increase over the best pre-war year, but fell to 7,000 kg. (7 long tons) in 1953. Almost all the production was exported to Indonesia until this market was closed for political reasons. Only small amounts of *trassi* have been sold in New Guinea, though if used within the territory it would be a useful supplement, especially for protein and calcium, in the diet of the people.

The shrimps are spread on sacks in the sun until half dry. They are then mixed with one-sixth their weight of salt, and the mixture broken up as finely as possible in a vessel made from a hollowed-out tree trunk. Sometimes feet (carefully cleaned) are used in this process. The resulting mass is left to ferment for two or three days in a large heap, and then spread out again to dry. Rice meal is probably added before the final drying. *Trassi* is prepared at Merauke only by Javanese and Chinese; Papuans are involved only as hired labour.

Conclusions

Fermented fish sauces and fish pastes are used widely in South-East Asia. where they render rice diets both more palatable and more nourishing. They provide a cheap and relatively simple means of preserving most of the food value of fresh fish without expensive equipment.

They have been made at Merauke in Netherlands New Guinea and on a very small scale at Arama in New Caledonia. Their manufacture should also be possible in other places of the South Pacific, especially those where an Asiatic population would provide a ready market.

If these fish products should prove acceptable to the indigenous peoples. they would be a nutritionally valuable supplement to diets based either on rice, bread or starchy roots.

FISH SAUCES PROVE POPULAR IN AFRICA

Encouraging Results From Acceptability Trials

IN the foregoing article describing the preparation and use of fish sauces in South-East Asia, it is suggested that they might well be useful in other parts of the world where the people's diet supplies little animal protein.

In Africa, the average diet in many parts appears deficient in protein, especially animal protein. Fish sauces are not used, but offer an obvious possibility of improving the position. Recently the Food and Agriculture Organization of the United Nations requested the Food and Nutrition section of the Research Institute of the French Cameroons to study the acceptability of such products by Africans. The results of this study have been described by Masseyeff, Cambon and Bergeret in the issue for April 1955 of the French journal *Encyclopèdie Mensuelle d'Outre-Mer*.

The products used were prepared

in France by the fermentation of surplus whole fish and fish guts. They differed from the *nuoc-mam* of Indo-China only in being more concentrated. Two forms were available: a paste with 55% of protein and a powder which was still more concentrated. Both had the high content of essential amino-acids and of vitamins (especially vitamin B_{12}) characteristic of this type of food.

Details Of Trials

The trial was carried out in the towns of Douala and Yaoundé, and also in tribes varying in their racial origin and degree of social and economic development. At Douala the test was made in municipal restaurants. These are used by workers in the town, who are often bachelors with little opportunity to prepare meals themselves. The meals supplied consist always of a plate of rice flavoured with a sauce containing meat, peanuts, tomatoes, pimento and palm oil. The restaurants charge low prices, a meal costing 20 African francs (about 12.5 Australian pence), or half this sum if the meat is omitted.

The paste was added to the sauce at the rate of either 6 grams (0.22 ounce) or 9 grams (0.33 ounce) per plate. The trial lasted three days, during which 775 persons were asked their opinion of the sauce, which was favourable in 95% of the cases, regardless of the amount of paste used. Those whose dishes contained meat considered that its flavour was strengthened, and those who ate a sauce without meat reported a wide variety of flavours with fish predominating.

In the villages 10 grams of paste, or the corresponding amount of the more concentrated powder, were distributed for each adult, and one-half, one-third or one-quarter as much for children, according to their age. It was explained to the housewives that the paste or powder should be added to the sauce when it was cooked.

In one village the people were Mohammedans and refused to try the paste which, they thought might be contaminated with some product of the pig, an animal considered impure by their religion.

In three other villages the number of people whose opinion was obtained ranged from 555 to 1,425, and the percentage of favourable opinions from 62 to 95. Over the whole trial 88% of the people who tried the sauce or powder approved of the effect on their dishes.

The results of this trial show that the nutritionally-valuable products from fish sauces are acceptable to African peoples, both those who still live in primitive conditions in the villages and the more advanced town dwellers. If such products can be supplied at a low price they may well make a significant improvement in the African diet.

The authors of the article consider that the essential requirement of cheapness may be met in commercial production, as the surplus fish or fish waste used as raw material has little value unless processed. The importance of attractive presentation of a new food is stressed. In Africa as elsewhere a product presented in neat, clean, brightly-coloured containers is likely to be well received.

This work might well serve as a model for studies of acceptability of unfamiliar products by native peoples. It shows that a new product can be welcome even in the allegedly conservative African villages. In the Pacific islands, imported foods are already familiar in many territories, and the chance of acceptance of new items probably depends largely on the ease or difficulty with which they fit into the accepted ways of cooking.

Fish sauces are obviously most easily used by people whose food consists largely, as in the African villages studied, of a cereal (rice or millet) flavoured with a tasty sauce. They can also be added to all sorts of soups and stews.

—H. S. McKee.

Villagers from Ateou discuss agricultural problems with Dr. H. S. McKee, food technologist to the South Pacific Commission.

New Species Of Fig Tree Named After S.P.C. Officer

A SPECIES of fig tree that grows in the forest near Atéou, a village in New Caledonia, has recently been named *Ficus barraui*, in honour of M. Jacques Barrau, subsistence agriculture officer to the South Pacific Commission. He collected a specimen and sent it for identification to the *Muséum National d'Histoire Naturelle*, Paris. It was found to be a species previously unknown to science, and was accordingly described and named by Professor Guillaumin, the noted authority on the plants of New Caledonia.

Most villages in New Caledonia are either near the coast or in deep valleys at low elevations; a few only are high on the mountains. Atéou, which is inland from Koné, is built at about 2 000 feet on a shelf at the base of a steep, forested mountain. It is an isolated village, far from any road, and reached only by rough tracks on which goods are carried in and out by pack horses.

The village has extensive plantations of arabica coffee, grown in the shade of natural forest. This practice has often been found unsatisfactory in New Caledonia, but seems successful here, last year's coffee harvest for the village being 18 tons. Taros are also grown in clearings in the forest, and in ingeniously-irrigated beds perched on steep slopes below the village.

The forest contains several species of trees with edible fruits and nuts, which when in season add variety to the diet of the people.

—H. S. McKee.

Price Increases For Copra From Papua And New Guinea

INCREASES in the shipping freight rates for copra from Papua and New Guinea to Australia have necessitated an increase in the prices of copra supplied to Australia. The new prices are:

Hot-air dried copra	£83	10	0
Fair merchantable sun-dried copra	£83	0	0
Smoke-dried copra	£82	7	6

The new prices took effect as from 1st September 1956, on shipments ordered after that date.

INTRODUCTORY NOTE

Bookshops are focal points in meeting the literature needs of any area. In developing regions such as the Pacific, the production of new literature designed to meet local needs can be encouraged and stimulated through literature bureaux, literature committees, and other official and non-official territorial organizations. However, it has been found elsewhere that even when it has been possible to produce a large volume of literature prepared for local use, eventual success or failure depends almost entirely on the channels available for retail distribution.

In the Pacific it is probable that, although there will be a continued increase in the number of books produced especially for the islanders, many needs will still be met from books produced for use in other tropical regions, and for the metropolitan countries.

These points, coupled with the fact that there is a definite need in most of the islands for facilities to purchase books, make the establishment of bookshops of great importance.

The South Pacific Commission Literature Bureau has, from its inception, been conscious of the importance of the establishment of bookshops in the islands. Numerous enquiries received by the Bureau from many people in the territories about how they may best meet their needs for obtaining books by purchase, indicate that in many parts of the region bookshop facilities are inadequate.

Fiji and New Caledonia are reasonably well served with bookshops which cater for local needs; the Government of the Gilbert and Ellice Islands Colony is encouraging bookselling facilities through co-operative stores; and, as mentioned elsewhere in this issue, Messrs. Beadel's Bookshop, Port Moresby, are now stocking certain books designed especially for local use. In other territories, to the best of our knowledge, needs are being met to a limited extent by education departments through their own book stores, which naturally mainly cater for school needs, by missions with small-scale bookselling facilities, and by some trade stores, which stock only a limited range of reading material.

The Methodist Mission in Western Samoa realized the potential need for a wide variety of books available for purchase, and last year began the building of a bookshop in Apia, capital of the territory.

The Rev. N. H. Mapperson has organized and planned the whole of this bookselling venture since its initiation. He had no previous experience of bookselling, but it is obvious from his article which is printed below that he has rapidly gained experience and his initial lack of certainty about the scheme has been replaced by confidence in the future.

BRUCE ROBERTS,
ORGANIZER FOR ISLAND LITERATURE,
SOUTH PACIFIC COMMISSION.

People attending the official opening of the Wesley Book Shop on July 25, listening to an address by the Chairman of the Methodist Mission in Western Samoa, the Rev. R. W. Allardice.

A Bookshop For Western Samoa

This account of the official opening of Western Samoa's new Wesley Book Shop was contributed by the organizer of the venture . . .

The Rev. N. H. MAPPERSON

ON July 25 a gold ribbon was snipped at the door of the modern new Wesley Book Shop in the centre of Apia, the capital of Western Samoa. The ceremony, performed by the High Commissioner of Western Samoa, Mr. G. R. Powles, C.M.G., signified the opening of a wide range of literature for the 100,000 people whose homes are in these isles of the Pacific. It is the first bookshop of its kind to be set up in Samoa and thus its opening marks a step in the history of the development of this island group.

The Methodist Mission first decided to embark on the venture at its Synod in November 1954. Actual construction work began in September 1955, but before that the organizational work was taken in hand and orders for stock were sent off.

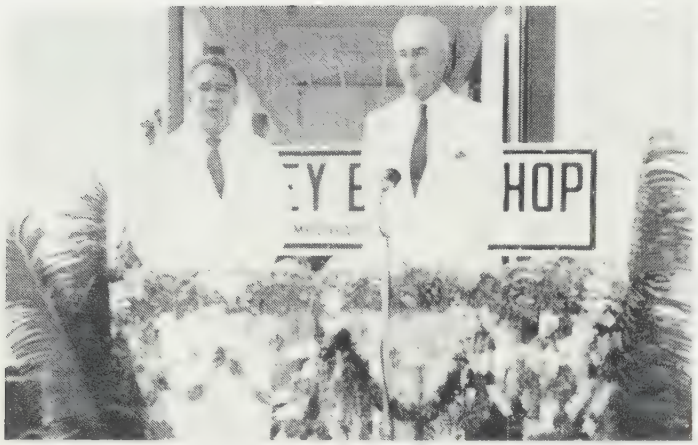
Owing to delays in the building of the new shop business was actually begun in temporary premises, a renovated weatherboard building. The experience gained over a period of three months proved very valuable, as it pointed the way for wise management, gave clues to sales service, costing, ordering, accountancy, and gradually built up confidence in the venture. Gradually, too, public interest and enthusiasm was aroused.

Bookselling being a new activity in Samoa, the staff had to feel its way, too, along a new path.

As the shop was nearing completion, the task of transferring stock was undertaken. This necessitated a complete cataloguing of all the stock, and over 1,000 cards had been filed before the opening day.

An Ideal Site

The new shop has an ideal site in the centre of the town, on the main street.



Above: The High Commissioner for Western Samoa, Mr. G. R. Powles, C.M.G., addressing the gathering. The sign behind the dais indicated the location of the temporary premises used for three months while the new shop was being built. Right: Inside the shop on opening day.

It continues the row of modern new buildings begun by the stately Wesley Church, and the two-storey Bank of New Zealand building.

At the opening of the shop the Chairman of the Methodist Mission in Samoa, Rev. R. W. Allardice, B.A., Dip.Ed., reviewed the way in which the old men of the Church had voted the money for this venture, although they themselves would receive little direct benefit from it. They had felt it of vital importance for their children, who were receiving good education in English.

The Chairman gratefully acknowledged the encouragement of the authorities, who had waived customs duty on materials to assist in the realization of a literature supply for the people. Especially valuable, he added, had been the guidance of the South Pacific Commission through its Literature Bureau. Sound advice and reliable information had been freely given, and this personal backing had done much to ensure the success in the organization of the business.

Mr. Allardice said that the Mission had been very fortunate, too, in the generous and expert services given by the young architect and supervisor, Mr. L. Pearson, who had further enhanced his reputation for well-finished work and had added this new shop to set good architectural standards for the township.

Mr. Pearson himself paid tribute to the pioneering spirit of Christian Missions which had so often led the way in the development of the peoples of different races.

The High Commissioner stated that in his opinion the year 1956 would prove of even more importance than 1954, the year of Samoa's Constitutional Convention, as 1956 had seen the opening of the first bookshop. It was also expected that before the end of the year important news would be forthcoming concerning a public library for Apia.

Souvenir volumes were presented by the Book Steward, Rev. N. H. Mapperson, to the High Commissioner and the Honourable Fautua, or High Chiefs, Tamasese and Malietoa.

A Modern, Well-Appointed Shop

Inside, the shop is bright and well arranged. Dark green walls set off the white shelves. The floor is covered with grey rubber tiles marked into large squares with green feature strip. Neon tube lighting has been installed along the slender white beams of the ceiling and above the front windows. Magazines are displayed on the showcase-type

The Rev. N. H. Mapperson, book steward of the Wesley Book Shop, outside the shop on opening day.

counters and quick-sale bin tops which are centrally situated. A small section holds the few (pathetically few) slim booklets available in the Samoan language.

The shelves around the walls are marked with neatly-printed cards indicating the classification: Children's, Religion, Biography, Educational (subdivided into Dictionaries, Arithmetic, English, etc.), Children's Fiction, Pacific Interest (one of the most popular sections), Fiction, Hobbies, Cookery and Domestic topics, etc. These classifications give some idea of the range of literature covered.

Opening day meant a crowded shop. The doors had to be shut at times to keep the crowds within controllable proportions. School children just had to be banned for that day—there is no sign of backwardness in Samoan children where there is anything new to be seen!

The proceedings, recorded by the Broadcasting Department, were re-broadcast in English and Samoan at night; thus, the whole of the island group enjoyed some of the interest and excitement of the day. The crowds which had gathered from the villages celebrated the occasion by a feast. A brass band was in attendance too.

Enthusiastic Public Response

The public response to this new shop's opening has been far greater than had been expected. It is apparent that the shop's ideal situation has much to do with its success. Apart from that, however, the time was most opportune for such a venture, as the younger generation with its higher standard of English and with far more contact with the rest of the world than ever before, is eager and hungry for reading matter.

It is obvious, too, that the scores who now browse around the shelves are revelling in the new experience of handling books. This in itself has been rewarding to the sponsors of the business. Already several schools and institutions in the territory have begun buying for library purposes. Special orders are being received daily from individuals, magazine subscriptions are steadily increasing, and sales daily are maintaining a high rate.

The true value, however, of the new shop can never be measured in figures, for its influence in the lives of the future generations may well prove a directive force in the development of Western Samoa.

Problems Of Coffee Production In New Caledonia .... (1)

By E. J. E. LEFORT*

THE development of coffee production in New Caledonia is dependent on the solving of a number of problems—particularly those of a technical nature. It is proposed in this article to consider these in some detail; the solution to them lying in the field of agronomic research and agricultural extension. To apply what is already known to what one already possesses seems to the author an excellent guiding principle for improving the cultivation and processing of Caledonian coffees. The technical suggestions made here will be along these lines.

Operatives in a New Caledonia coffee processing plant sorting coffee beans by hand on a travelling belt.

Coffee cultivation has long been the main agricultural occupation in New Caledonia. Although environmental conditions are most favourable for growing coffee, yields are nevertheless extremely low. This is mainly due to the lack of rational methods, and the fact that production is based largely on foraging.

Coffee production in New Caledonia might easily be doubled by applying the technical methods described below. However, before putting these into practice, field trials should be undertaken by technical specialists.

Renewal Of Plantations

As the average age of New Caledonian plantations is over 40 years, general renovation should be undertaken in order to eliminate any defects arising from senility. This is usually carried out by cutting back the tree to a height of approximately 12" to 18" from the ground. Only the most vigorous of the suckers which develop around the cut area should be allowed to remain. Research needs to be undertaken with special reference to New Caledonia on the optimum number of shoots to be kept—in relation to variety, climate, quality of the soil, future changes and density of planting.

Restoration of plantations might be undertaken progressively according to the resources and intentions of the planter. Such restoration should always be followed by the establishment of new plots, to assure continuity of production.

Establishing New Plots

In view of the old age of plantations it is obvious that if no attempt is made to put new ground under cultivation, coffee production in the island will gradually die out. In New Caledonia an undertaking of this sort would be restricted to some extent by the labour factor: it is therefore considered that this would be really accepted only by native planters who are not dependent on this particular factor. Indeed, during a recent tour of the island the author had the opportunity of inspecting several new native plantations which had been created entirely through personal initiative; decidedly a good omen for the future of coffee in New Caledonia.

Any new plantation established should be built up from selected plant material. Nothing of this sort exists as yet in New Caledonia, where young coffee plants result from spontaneous sowing. However, there appears to exist in some of the plantations on the island a variety of Robusta with homogeneous berries, and a very worth-while hybrid, Arabica x Robusta, which has apparently been stabilized. The phenotype of the latter and its yield are similar to that of Robusta, while the organoleptic qualities of the berries are very reminiscent of Arabica. The importance of this hybrid lies not only in its good yield, but also in the fact that it would seem to be resistant to *Hemileia vastatrix*.

This plant material would be more than sufficient to give new life to the island's coffee production, provided its trial period proved successful. If it did not, it would be possible to introduce inter-varietal and inter-specific hybrids from Java, and to study their behaviour under the different ecological conditions of the island.

In order to avoid the possibility of weakening in non-stabilized but valuable hybrids, asexual propagation might be adopted, such as grafting and planting from cuttings. The former can now be done mechanically, whereas the second requires further study.

In order to obtain the plant material necessary for establishing new plantations with greater rapidity, mass selection might be undertaken. This could be done in sample plantations whose vigour and production characteristics should be tested at the time of selection, or by taking into account the former record of behaviour and yield. The former method would be easier, but its effectiveness would first need to be proved.

Aspects of coffee-growing that will not be discussed in this brief study include the usefulness of nursery plantations, various methods of planting out, choice of land, advantages and disadvantages of systematic denshering after felling, importance of the type of planting hole, density and shade required initially. All

* Research Officer for Economic Development, South Pacific Commission.

Left: Hulling coffee beans for home consumption, with wooden pestle and mortar.

Right: Drying coffee-in-parchment on a tray in the sun.

these points require analysis in respect of pedological and climatic factors.

Maintenance Of Plantations

The coffee plant is one of the useful plants in the tropics which suffers most from weeds. In New Caledonia, where plantations are rarely clean, this is particularly so.

Order can be maintained by weeding, ground clearance, mulching and the use of cover plants. The first two generally entail the risk of degradation, and are costly; the third, which protects and enriches the soil, is likewise expensive, whereas the last has some of the advantages of the former without involving great expense, especially if a creeping plant such as *Indigofera endecaphylla* is used. In New Caledonia this choice has yet to be made, except in extremely dense and overgrown plantations where there is no need for further control. However, in this case protection against pests and diseases, and also harvesting, become difficult problems.

Pruning the coffee shrub is a very controversial method of maintenance. Research should be undertaken in the territory, to decide whether it is sufficient to keep the shrub in proper condition merely by topping and cutting out suckers and broken or dead branches, or whether it is necessary to use the orthodox method of pruning, producing simple or multiple trunks.

The question of shade is every bit as controversial as that of pruning. The varying reactions of the coffee plant to shade seem to be connected with the conflicting efforts of the roots of the coffee shrub and shade tree to obtain water. Conditions of climate and soil are important factors in this respect. It would be interesting to compare their influence on shade on the west and east coasts of the island.

Protection against plant and animal pests and diseases of the coffee plant is an important problem in New Caledonia, particularly as there is no organized parasite control. The French Institute of Oceania has carried out large-scale research in this field, but the recommendations formulated from the results obtained have not yet been applied. Several phytopharmaceutic techniques are worthy of particular study. Certain products, such as D.D.T. and especially H.C.H., are a very effective remedy against the coffee-bean borer (*Stephanoderes hampei*). The amounts to be used and the frequency of application need to be established in detail. In the case of *Hemileia vastatrix*, trials might be carried out with Bordeaux mixture and other anti-cryptogamics to evaluate their effect at varying concentrations and at different seasons.

Fertilization of the coffee plant is rarely practised in New Caledonia, and yet this is a means of producing the maximum profit. In view of this fact it would deserve an important place in the programme of coffee improvement for the territory.

Humic fertilizers might be supplied from manure, parchment composts or manure crops. The choice between application in ditches running between the rows, and mulching, should be made along rational lines. The effect of mulching on yield is apparently unquestionable, but unfortunately a large quantity of vegetable matter is required for its composition, thus increasing production costs. However, there is a possibility that by regular cutting of such cover plants as are readily found in New Caledonia, an inexpensive method might be evolved for producing mulch with a decidedly beneficial effect, since it would consist solely of leguminous species. Further, it should not be forgotten that all waste matter left after harvesting, such as maize, wheat and rice straw, potato and bean tops, etc., would be put to a more rational purpose if used as mulch than by being burnt as is usually the case.

It should be added that on the east coast of the island, where rainfall is generally more abundant, mulch might be obtained from banana palms, planted as inter-row crops in coffee plantations. This combination of crops, if properly effected, should not necessarily lead to a struggle for intake of water and valuable minerals in the soil. The banana palms would provide sufficient shade and produce fruit, while their stems and foliage would supply the mulching required for reducing evaporation from the soil and maintaining the yield of the plantation. However, this practice would prove worth while only on condition that the planter realizes that the banana palm requires chemical fertilizers just as much as the coffee shrub. We have seen this method being successfully operated in the West Indies, and it would be worth a trial in New Caledonia.

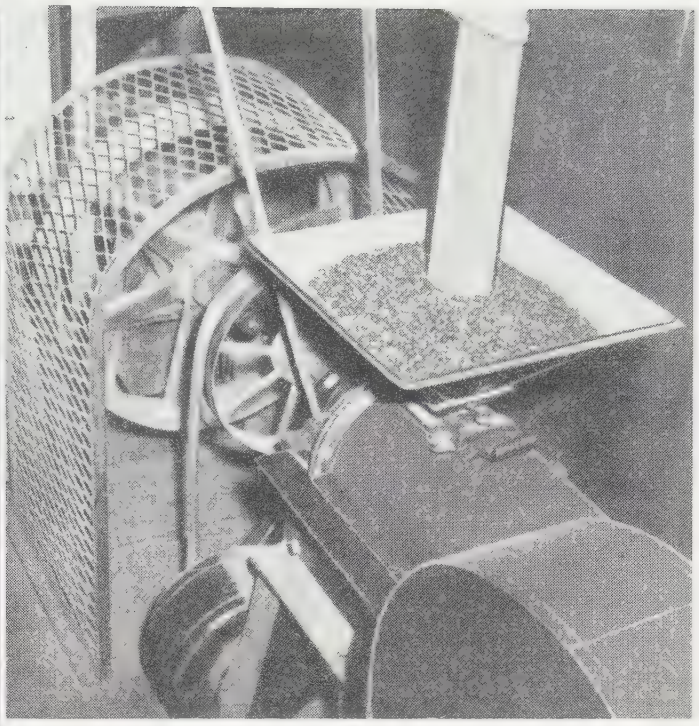
The use of mineral fertilizers is as important as that of humic fertilizers. Research needs to be done in order to determine the priority order of the main elements in respect of the particular needs of Caledonian coffee. The study of the lesser elements could be left to a later stage.

Possibilities Of Improving Coffee Processing In New Caledonia

Improvement in this branch of coffee production is largely independent of environmental conditions, and therefore does not require detailed research. Thus, any desirable changes are immediately applicable and, for this reason, have been accorded a special place in the present article.

Many New Caledonian planters affirm with complete conviction: "Our coffee

General view of equipment used for hulling and polishing coffee beans.



Equipment for hulling coffee beans processed by the dry method.

is extraordinary". It is a pity that this assertion should contain a mistake in tense. And yet, the former state of things might well be restored. All that is needed is a little more attention and care during processing. Indeed, the fine qualities of taste and aroma which gave New Caledonian coffees their reputation on the French market are still there. Their existence, combined with proper presentation, could quite well restore to the island's coffee production the good name that it should never have lost.

During his stay in New Caledonia the author has had the opportunity of observing the methods commonly used in the island for processing coffee. A description is given here, with emphasis on the errors noticed and the ways in which they might be remedied.

There are, of course, producers in New Caledonia who process their coffee perfectly competently. If no mention is made here of the methods they employ it is because they are traditionally acceptable and, therefore, call for no unfavourable comment.

In this section an attempt will be made to avoid systematic criticism and concentrate on constructive criticism only. It is hoped the comments given might assist planters to produce better-quality coffees.

Processing By The Wet Method

This is mainly used on the West Coast, where the majority of coffee producers are European.

Firstly, something should be said on the subject of harvesting, which has a marked influence on processing. Generally speaking, the early stages of harvesting are neglected and the final stage passed over hastily, or the grains left on the shrub. This method of operation, which is mainly due to the shortage of labour, results in berries being gathered at different stages of ripeness (apart from encouraging the borer to multiply). This mixture of beans at varying stages is then put to ferment.

In New Caledonia there are no combined washer-sorters. The process used is known as "floating" and consists of immersing the berries in water, eliminating by hand all the light debris (leaves, stalks and dried berries) which rise to the surface. Red and green fruit, as well as the heavy foreign matter (earth and stones) remain at the bottom of the tanks. At this point soaking begins: floating, soaking—and sometimes even fermentation — form one continuous process.

Soaking has been used on the island since the borer first made its appearance. It is an effective method of control, but also, as carried out here, a real danger for the quality of the coffee.

In the majority of cases Arabica does not undergo soaking, but passes directly to the pulper. On the other hand, Robusta, which is invariably attacked by the borer, is regularly submitted to this process.

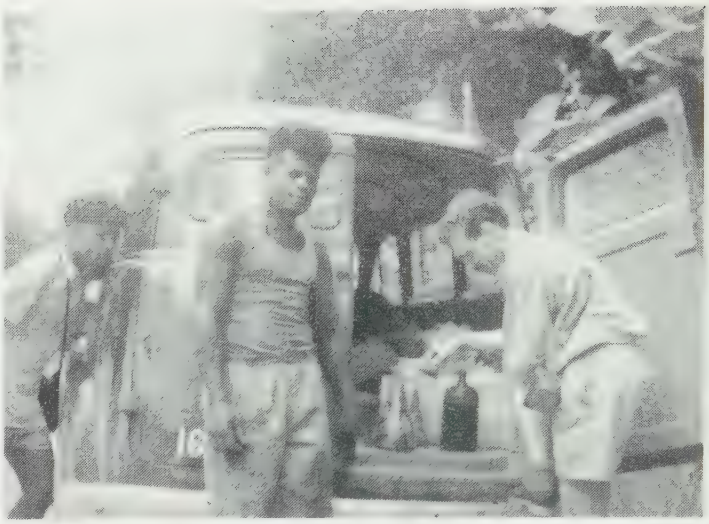
Most plantations do not possess fermentation tanks in cement, but only simple vats consisting of a barrel cut in half. All stages of processing, from washing the berries, soaking and fermentation to washing the coffee-in-parchment, are generally carried out in the same vat or tank, and with the same water. It should be added that very often soaking obviates the need for passing the berries through the pulper. This is so at least in the case of ripe berries where the outer covering has entirely disintegrated; they are merely washed briefly before being put out to dry. Only the green berries which have scarcely been softened by soaking go into the pulper, to be passed on for fermentation as coffee-in-parchment. All the fermented coffee, whether produced from ripe or green berries, is dried as one batch.

Without pulping, fermentation lasts from 4 to 5 days and takes place in polluted water which is rarely renewed. As a general rule the soaking period, which varies between 24 and 48 hours, is followed by pulping, and then by dry or wet fermentation, which lasts from 12 to 36 hours. Arabica, which is pulped directly, is generally fermented to a lesser degree than Robusta. In any case the coffee is never stirred.

The berries at the bottom of the tank are sometimes forced to undergo fermentation twice or three times over, depending on the efficiency of emptying, which is always a difficult problem. However, these over-fermented beans are, nevertheless, included with the normally processed coffee.

Pulpers consist either of drums or discs. Neither of these types possesses

Mr. F. E. Peters, Commission biochemist, collecting a sample of Pidgeon pea at Undjo, New Caledonia.



Mr. Peters and helpers preserving a food sample for later analysis, during a collecting trip to Tie, New Caledonia.

a device for retrieving the small, non-processed beans. Many of them have only a very low output, while others are too difficult to work for planters with no available motor power. These mechanical problems encourage the practice of easy measures such as prolonged soaking, which apparently solve the material difficulties.

Washing is frequently carried out in dirty water, by hand or shovel. The occasional berries which have escaped pulping and the pieces of outer covering which have undergone the same process as the coffee-in-parchment, are likewise put out to dry.

When the coffee-in-parchment has been washed the excess water is sometimes drained off. Drying is then carried out on a cement area. The beans are arranged in ridges so that the water runs off between them. During the operation the ridges are re-formed several times, and the beans are then placed in a layer of about two to four inches in depth. Most often, however, the beans are spread out directly after washing.

Drying lasts from 8 to 10 days, and stirring takes place with varying frequency, depending mainly on the labour available. During the first three days the coffee is exposed to the full heat of the sun. It is then placed in deeper layers, the depth depending on the degree of dryness; but the main purpose is to leave room for the newly-washed coffee coming in for drying. Protection against rain and night dew is generally afforded by sheets of corrugated iron. Drying trays are not as common as cement areas.

After drying, which is often only partial, the beans are stored. Here again, the depth of the layer of coffee depends rather on the room available than on the degree of dryness. During storage, stirring only takes place in occasional instances.

The natives of some inland tribes use a method of processing which gives good results. The success of this method does not depend so much on particular care in processing as on the quantity of water which the natives have available *and which they use*. The berries, which are placed in baskets, sacks, or latticed boxes, are left to soak in running water for varying periods. This excellent method of soaking does not jeopardise the final product, since the continuous renewal of water retards fermentation of the outer coverings. The softened berries pass easily through the hand-operated pulper.

The coffee-in-parchment is then placed in small heaps to ferment by the dry method for 36 to 40 hours, and is then washed, always in running water. It is then dried on trays or mats, which can be easily placed under shelter.

(To be continued)

Preserving Food Samples For Analysis

IN 1954 the South Pacific Commission began to build up a biochemistry laboratory in Nouméa to analyze the foods which are eaten by the peoples of the South Pacific. Although many of the foods of interest to the nutritionists and agriculturists are found in New Caledonia, there are also many which do not occur there. These must be collected elsewhere and sent to Nouméa.

"Dry" foods such as beans and nuts which may be stored do not require any special treatment, other than fumigation to kill insects and fungi, before they are sent from, say, Rabaul to Nouméa. "Soft" foods and fresh foods like sago or breadfruit *do* need preservatives to be added, however, to prevent them from fermenting or otherwise deteriorating on the journey. Satisfactory methods of preservation have been worked out for the various types of food, and now most Commission officers visiting the territories carry ampoules of preservative with them and send samples back to Nouméa for analysis.

The preservative which is most generally used is a dilute solution of oxalic acid, plus a few drops of chloroform. This will stop fermentation and the growth of moulds.

Samples preserved in this solution may be used to determine all the constituents of interest except a few vitamins. If the latter are to be determined, a special solution containing caustic potash and alcohol is used. The food to be preserved is cut into very small pieces, or minced very finely and mixed with a known amount of the preservative.

Most of the foods which have been analyzed to date have been collected by officers of the Commission during their visits to the various territories, although several interesting samples have been forwarded by residents and government officers.

—F. E. Peters.

PICTURE CREDITS

Acknowledgement is made for photographs reproduced in this issue as follows: Front cover and pages 14, 15, 28-33 inclusive, 35-37 inclusive, and 43, Australian Official; page 7 (top), 11, 12, 13, 41, 42, Fiji Official; pages 8, 9, 10, 19, Donald Ross, Photographer, Apia; page 20 (left), Henry Forsgren, Apia, (right) Edwards Studio, Apia; pages 25, 26, 27, French Institute of Oceania; page 40, Netherlands Official.

Orsom III is 75 feet overall in length, with a beam of about 18 feet, nett tonnage being 67-54 tons. She is powered by a 135 h.p. V8 diesel engine.

A Cruise In Orsom III

. . . A first-hand account of a brief cruise in ORSOM III, *recently-commissioned oceanographic research vessel of the French Institute of Oceania, Noumea.*

By LOUIS DEVAMBEZ*

HAVING for some time felt keen curiosity concerning the activities of *Orsom III,* it was with great pleasure that I accepted an invitation for a brief cruise.

On arrival, I was shown over the ship by the Captain. The inspection began in the spacious and comfortable fo'c'sle, which houses eight berths for the officers and research workers, and also serves as a wardroom. A short flight of stairs leads directly into a very small galley where we found the Indo-Chinese cook, Antoine, busy putting away provisions.

Beyond the galley is the laboratory, with its two sinks, central table, and storage units around the walls. An assortment of curiously-shaped equipment caught my attention, and my mind was already formulating the many questions I would ask the oceanographers as soon as they were free.

From the laboratory we climbed down into the engine-room, where I was introduced to the Chief Engineer and the Second—both New Caledonians—who were occupied with last-minute preparations. They proudly showed me around the main engine, and the generators supplying current at 32 and 110 volts.

Back on deck, the Captain led me to the bridge, then to the after-deck, where he showed me the oceanographic winch, the davit used to lower oceanographic apparatus into the sea, and finally the crew's quarters, where eight men live in reasonable comfort.

On each side of the superstructure, approximately opposite the main mast, stood a long bamboo pole. These are the outriggers which make it possible to spread ten trolling lines at a time, as was explained by the First Officer, to whom I had just been introduced. Short and blond, the First Officer offered a striking contrast to the Captain, who is tall and has slightly greying hair. Both, however, hail from Brittany and, with the two New Caledonian engineers, and the three oceanographers—respectively from eastern, central and south-western France—they make up a very colourful staff indeed. Something of the same originality is reflected in the crew, where I found, among a group of Belep Islanders,[1] a sailor born on Palmerston Island in the Cook Group. What really matters, however, is that whatever their origin, all on board love their work.

The Captain had left us to attend to some final details. In his soft Breton accent the First Officer explained that on this trip we were to make some trolling experiments with a motor dinghy very close to the main reef. As the dinghy was to be towed at the stern it would not be possible to troll the three after-lines. When pressed for an explanation he answered with a smile, pointing out the five trolling lines bent onto each outrigger and the hauling lines used to bring them inboard when a fish is to be landed. I was soon to see all this gear in action, since by that time we were pulling away from the wharf. We were barely in the middle of the harbour when the great outriggers were put in working trim, and the trolling lines were in operation.

The traditional *aperitif* brought together on the bridge the officers, the oceanographers and the stranger seeking information. The weather was good, the sea calm; everything was right, including the lunch which followed.

Halfway through the meal the First Officer, warned no doubt by some sixth sense, hastily excused himself and rushed out on deck. I should have liked to follow him so as not to miss the first catches, but he reappeared as fast as he had left, announcing two misses. Lunch ended uneventfully and the First Officer then took me off to explain the differences between the various trolling lines —the first one very long, then two others of diminishing length every third of the outrigger's span. These three lines (six in all on the outriggers) are of hemp, with a nylon leader about 33 feet long tied to a double hook. This hook is trimmed with a handful of nylon "horsehair" containing a mixture of white and red or white and yellow threads.

All these lines are equipped with rubber sandows which act as shock absorbers against the strikes of large tuna to prevent breaking.

At this very moment one of the sandows began to stretch, followed closely by a second—five strikes in all, of which only the first produced a kingfish.[2] This was poor fishing in comparison with the tuna caught on previous cruises. The marine biologist was puzzled by the succession of misses but the First Officer accepted them philosophically, as he was sure there was nothing wrong with his lines—he had assembled them himself—and fishing was always a matter of what the fish decided.

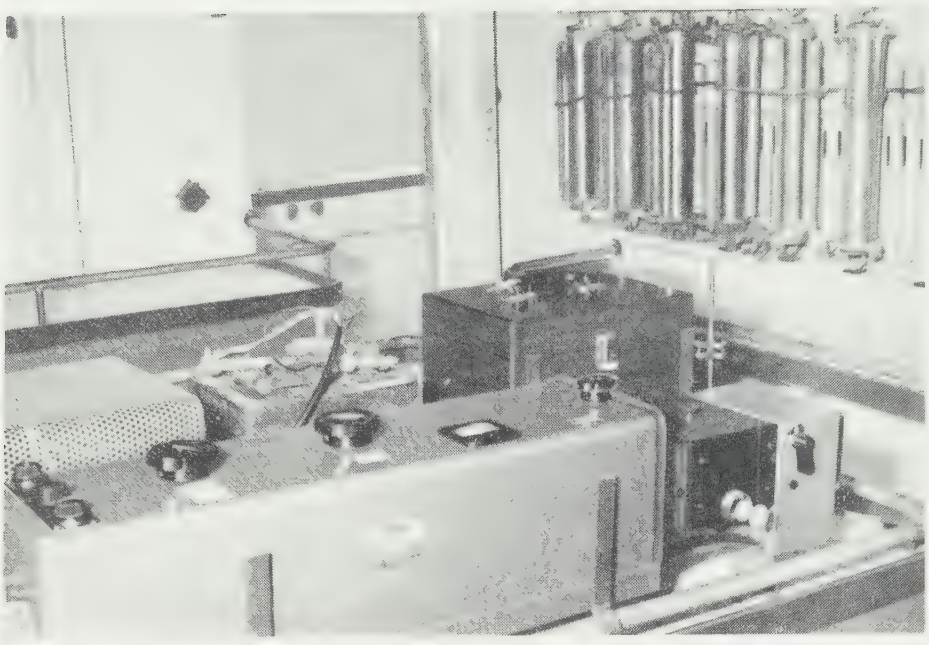
We were scheduled to anchor that evening some twenty miles from Noumea, after doing some experimental dredging and setting out gillnets.

Out came the dredge, a sort of magnified steel rake, followed by a sturdy bag

* Economic development section, South Pacific Commission.

[1] The Belep Islands are a small Group 45 miles N.N.W. of New Caledonia.

[2] In this case, *Acanthocybium solandri,* C. and V.



The ship's laboratory. Reversing bottles and thermometers are kept in racks appearing at top right. The apparatus on the table is a spectrophotometer, used for making analyses of sea water.

net made of heavy hemp material. This gear was dragged by the motor dinghy along sea bottoms that were sometimes rocky, sometimes sandy. We wondered whether we would find scallops—those relatives of the European species, smaller, but just as palatable as their cousins. The first drag produced only empty shells; so did the second, with however a curiosity, a beautiful Venus' comb—not a very large specimen but a perfect one.

We changed course and went to test the vicinity of an area where the First Officer had already dredged a week earlier, with some success. On the first drag the heavy gear came aboard three-quarters full of the branchy, finger-thick sponges which clutter certain sandy beds when there is a slight admixture of mud. In this tangle we found about half-a-dozen scallops, some of them of good size, and a second Venus' comb, unfortunately broken.

A further series of drags successively brought up scallops, a tiny seahorse, some pipe fishes; then nothing more but mud and seaweed. Evening was approaching and we still had to return to the ship for the nets, go out and set them, and then make for the scheduled point of anchorage near a group of small islands, the inner channels being too shallow. The First Officer was to do all this and precede us to the rendezvous.

During dinner conversation centred first on the scallops, which I was to taste raw for the first time. They are delicious, to be recommended to all who like sea-food. The whole catch was devoured without adversely affecting our healthy appetites, and we proceeded to do honour to the excellent cooking of Antoine.

After dinner a group went hand-lining in the motor dinghy, but I did not join them since I wanted to see the hauling-in of the nets at dawn next day.

I was wakened at 4.30 and we hastily gulped down our coffee. Meanwhile the First Officer was already steering the motor dinghy towards the channel where he had set his nets. We met with a brief shower en route and saw some lightning far to the south.

We were now at the marker buoy. One by one the nets were taken in. Seaweed clung to them, but no fish. This is one of the minor mysteries that the First Officer is patiently trying to solve. He is well aware that one cannot be successful every time, but he wants at least to determine the best combination of meshes, bottoms and currents. Then? Well, then he will look for another fishing problem to study. There is no scarcity of them.

Directly we returned *Orsom III* was under way. The trolling lines were put out again and the watch resumed. We had to keep a look-out for the flocks of birds announcing tuna. Here they are black, or rather dark brown birds: in other places fishermen follow only white terns.

Before reaching the pass we saw some fish jumping in the distance, and changed course. We were on the school in a few minutes, and immediately caught three tuna.

I will never tire of admiring these splendid creatures, with their bright yellow fins and their flanks washed in gold. The gaff had wounded their flanks and the deck was streaked with blood. A stab with a marlin-spike soon stopped their vain threshing. They were already gutted and I bent over a stomach with one of the oceanographers, trying to make out something recognizable in the handful of half-digested food. The marine biologist obligingly pointed out some crustacean larvae and two or three small fish which had not completely lost their shape. All the stomachs were then examined at leisure in the laboratory of the French Institute of Oceania.

During this time we had covered some distance and were now in the pass. We were scheduled to travel about 15 miles outside the main reef. A south-east breeze had risen, and was freshening.

For a few minutes we had been gradually drawing away from the reef. This, explained the marine physicist, was in order to carry out oceanographic "station" work. The ship hove to and the crew went into action around the davit and winch.

First the bathythermograph was lowered to a certain depth, then taken up again. This apparatus, the Captain explained, simultaneously records depth and temperature. It is, indeed, of great importance to determine exactly at what depth each sample of water is taken. By knowing the length of cable paid out and the angle at which the wire deviates from the vertical as it leaves the davit, it is possible to obtain an approximate indication of depth. However, the ship always drifts slightly, or sub-surface currents pull the cable into a curve, thereby distorting the results of calculations. These must be based on another known factor, which is given by the bathythermograph. The temperature varies in different layers of water, and its true recording in relation to depth gives accurate data. Since each Nansen bottle is fitted with a set of reversing thermometers, the depth at which each sample has been taken can be determined with a high degree of precision.

It is now the turn of the bottles to be lowered. Briefly, the oceanographer explained their working. Fixed at the top and bottom to the cable of a special winch, these bottles remain open at both ends while being lowered into the water.

Once they arrive at the required depth which is calculated approximately from the angle of the cable with the vertical—a small cylinder of metal is sent sliding along the cable to strike the release mechanism, thus causing the bottle to pivot around its lower end, at the same time closing two plug valves at each end. The bottle then contains a sample of seawater taken at a certain depth.

All this information was being given as the corresponding operations took place, which made it easy for me to follow. I cannot hope to present them as clearly here.

The bottles were beginning to reappear from below, twelve of them in all, at

intervals from the surface to 500 metres depth. As had been explained to me, the first one was released by a messenger sent from the ship. Upon reversing it released a second messenger, which struck the second bottle, and so on down the cable.

As they arrived aboard, the bottles were stripped from the cable and immediately placed in their racks. Interest was now centred on the laboratory, where operations followed each other in rapid succession. Samples were taken from each bottle to measure the pH and dissolved oxygen content, the salinity, phosphate content, calcium carbonate, silicates, etc. All these analyses were carried out on the spot. Some samples, however, were kept aside in hermetically-sealed bottles, for analysis by more precise methods at the French Institute of Oceania.

The ship was under way again, and I came out of the laboratory in time to watch a plankton haul being made. A very fine-meshed wire net of nylon was fixed to a metal ring 0.50 metres in diameter. This funnel-shaped net led into a glass jar. It was to be dragged along at various depths for one hour at a time. An instrument attached to the net measures the volume of water passing through it. It is therefore possible to evaluate the average quantity of plankton in a given volume of water over the area tested. Here again the various determinations were made aboard the ship.

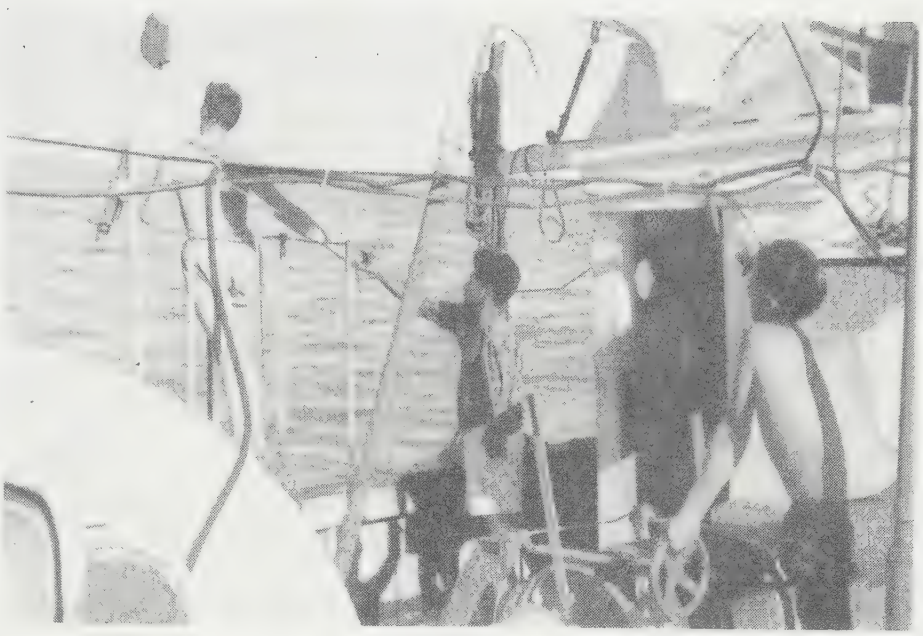
We constantly observed isolated birds which seemed to be looking for schools of fish. An occasional kingfish caused minor excitement.

Around 10 a.m., near the Isié Pass, it seemed that we had suddenly sailed into breakers, for spray dashed high on all sides. The First Officer gave two sharp orders, a number of fish suddenly appeared on the deck, and the men were still hauling tuna in without a break. My wishes had been granted in good measure. There on the deck, after half an hour's fishing, were about 30 tuna weighing from 10 to 20 kilograms each (22 to 44 pounds). This noisy feverish burst of activity, punctuated by shouts and laughter from the crew, ceased as quickly as it had started, as the school suddenly disappeared.

The deck hose spat and rumbled, the last smudges of blood disappeared, and here we were again examining stomach contents and the surprises they held in store: fish, small squid, etc.

The pass itself was a surprise. Instead of offering a mere break in the barrier reef it opens behind a curve of that reef and one must almost sail beyond it to find the opening.

As we were about to enter it a flock of birds was spotted just north-west of the pass. No mistake was possible; they were onto a school of fish. We made speed towards them and were soon in the midst of a pack of brownish gulls, which were screaming deafeningly. We had barely time to catch half-a-dozen skipjack and set course again for the inside of the lagoon, for the seas were becoming heavier and the motor dinghy, which was still in tow, threatened to give trouble.



A water-sampling operation in progress. The last reversing bottle is ready to be lowered. The dark object at top left is the meter wheel which records the length of wire paid out. At bottom right is the winch.

It was by the inside route that *Orsom III* reached her anchorage that night. As soon as the anchor was down the First Officer broke out his dredge and the motor dinghy resumed its slow toil. First, however, part of the crew had been put ashore on a little island as they wanted to cook a whole tuna in a stone oven, in the way so dear to Pacific islanders.

The dredging did not produce anything that day, but in compensation we sailed close to an islet I already knew for the tasty rock oysters to be found there. As we still had some time the First Officer decided to land, and for half an hour we feasted, not omitting, however, to gather a few dozen oysters for our colleagues aboard ship.

That night the menu was clearly influenced by the environment: fish soup, fried fish, steamed tuna, and assorted shellfish.

This was already the third day. We were scheduled for another trip outside the lagoon but the motor dinghy would stay at the anchorage, as the weather did not permit the experiments envisaged.

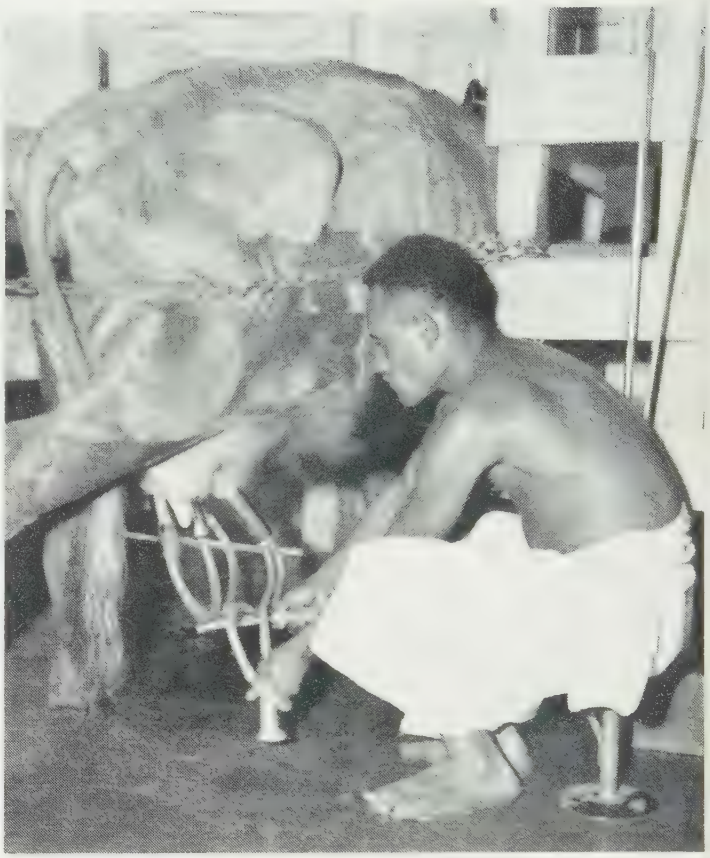
In the pass we caught two tuna, then a blue-striped runner—a splendid fish, more slender than the tuna, with blue and yellow stripes down its flanks. Another strike produced a fish of another species which looked somewhat like a cross between a tuna and a trevally.

Time passed so quickly that I barely had time to take notes. We had caught more tuna, bonito, trevally and other fish. Again we had dragged plankton nets, lowered the reverse bottles and examined the stomach contents of all the fish caught. At the appointed time the ship's radio had provided information from the Noumea Weather Bureau on the direction and force of wind and seas, as well as general weather reports.

I noticed that for several paragraphs I have been making increasing use of the pronoun "we", and this makes me realise the real aim of this cruise and all those that have preceded it.

The fact is that all the cruises logged by *Orsom III* to date have been made not only for scientific purposes but also with one major objective in view: that of creating on board a team spirit which is at one and the same time solid and dependable, and yet capable of adaptation to both the rude toil of life at sea and to the delicate work of research. This aim has been so successfully achieved that I, a stranger on board, almost felt that I belonged.

However, the cruise was drawing to a close, and it was not without regret that I spent the last morning keeping watch over the trolling lines as *Orsom III* brought us back to Noumea. Admittedly, I would not see the studies in the fields which will make future contributions to our present knowledge of marine life, but at least I shall know, when IFO publishes its oceanographic findings, that they are the result of extensive and varied research, carefully checked and cross-checked, requiring not only sound scientific knowledge, but also real seafaring courage.



Unloading copra at the island port of Samarai, Papua, for trans-shipment to Australia. The territory now produces about 100,000 tons of copra yearly, valued at nearly £8,000,000. Right: Modern milking methods are employed at the Government livestock station at Goroka, in the Central Highlands.

Economic Progress In Papua And New Guinea

Substantial progress is being made in the economic development of Papua and New Guinea, as this survey reveals.

By JOHN WILLOUGHBY*

THE territory of Papua and New Guinea is strategically important to Australia and their economies are, to great mutual advantage, largely complementary.

A very promising future lies ahead for the territory, but the pace of its economic development depends ultimately on the general advancement of the native people, for whom Australia long ago assumed responsibility.

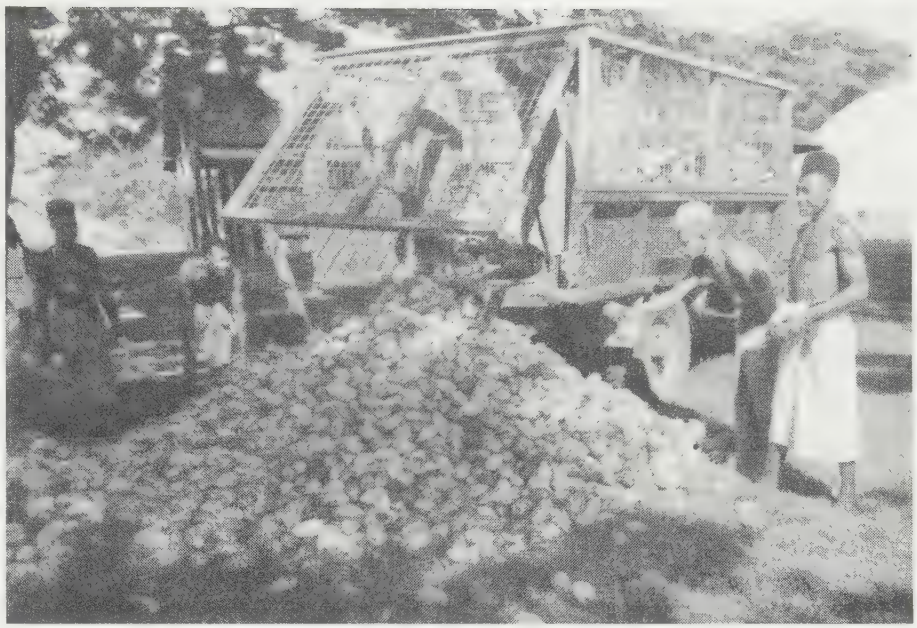
Recent economic development has been noteworthy in both agriculture (in which natives as well as Europeans have participated) and in the tapping of the valuable timber potential.

During the war in the Pacific, towns in the New Guinea area were completely destroyed and coconut plantations, which still represent the country's main economic asset, suffered extensive damage. Now, towns have been rebuilt, wharves and services re-established and damaged and neglected plantations restored. New industries, too, are coming into production and the acreage of crops such as cocoa and coffee is expanding rapidly. By 1954 production of copra and rubber, the territory's two main agricultural export industries, exceeded pre-war output.

An indication of the remarkable progress achieved is revealed by the improvement in exports over recent years. Comparing the export figures for 1948-9 and 1953-4, for instance, shipments of copra and copra products rose from 46,383 tons to 98,000 tons, the value

* Mr. Willoughby is First Assistant Secretary, Department of Territories, Canberra, A.C.T.

Portion of a 10-acre dry rice plot mechanically planted as a co-operative project by people of Amele Village, near Madang. The Territory consumes about 11,000 tons of imported rice a year, and the Administration is encouraging village rice-growing to reduce importations.



A load of cocoa pods being unloaded at Kokopo. Exports of cocoa beans, which totalled 200 tons in 1948-49, reached 1,106 tons in 1954-55.

rising at the same time from £1.9 million to £7.4 million. Rubber exports were nearly trebled to 3,145 tons. The value of timber exports, including plywood, rose from £23,207 to £181,849, while trochus and other shells exported rose in value from £29,900 to £209,090. Mineral exports in 1953-54 were worth £1,434,257.*

Exports of cocoa beans, which totalled 200 tons in 1948-49, reached 1,106 tons in 1954-55, and in the same period exports of coffee beans rose from 16 tons to 106 tons.

Road-Building A Major Problem

The rugged and mountainous nature of a large area of Papua and New Guinea, combined with torrential tropical rains, makes road-building a major problem, which directly affects the marketing of agricultural products, the development of highland areas and economic advancement generally. Transport in the territory is still largely by air and sea, but many roads have already been built. Roads are being built mainly from the main ports into the richer areas and between the principal highland centres. The wholehearted co-operation of natives, with hand tools and limited equipment, has been a major factor in opening up many miles of jeep roads.

* See Table, page 33.

Road access was recently established in the Sepik District between Wewak and Maprik, a distance of 95 miles inland and over the Prince Alexander Range. A jeep road recently opened from Gusap, on the Ramu River, to Goroka, the district headquarters of the Eastern Highlands, will eventually be extended to link up with the Eastern Highlands and Madang. This road will open up the Gogol River Valley and ultimately link Madang with Goroka in the Eastern Highland District, Mount Hagen in the Western Highland District and the port of Lae. The Markham River Bridge, an engineering achievement, was opened to traffic in 1955. It shortened the route and eliminated a former ferry crossing. From Port Moresby a road is being developed to the Brown River and then to Kanosia. Improvement in road communication, which is greatly assisting both cultural and economic development, is being continued.

Papua and New Guinea covers about 183,000 square miles, of which 27,000

Above: The new Wewak to Dagua road being built by the Works Department to open up the But-Boiken sub-division and give 8,000 people direct access to Wewak to market their produce. In the territory, roads are being built mainly from the principal ports into the richer areas, and between the main highland centres.

Right: Pit-sawing timber at Nondugl in the Morobe district. The timber industry in the territory has expanded substantially since the war, and today large quantities of sawn timber, plywood and logs are exported annually.

Native assistants harvesting coffee beans on a highlands plantation. Exports of coffee beans from the territory increased from 16 tons in 1948-49 to 106 tons in 1954-55.

square miles, or about 15 per cent., is at present considered to be commercially cultivable. This is an indication of the extent of the territory, which is rugged or heavily forested. Most of the 1¾ million natives are subsistence agriculturists, however, and some 650 of the European population of about 13,000 are planters and farmers. The natives are gradually being taught to improve their methods and range of crops with a view to increased commercial production.

Diversification Of Cash Crops

The main export product for many years has been copra, but recently the Government has encouraged diversification of agricultural production and, in the last five years, exports of rubber, cocoa, coffee and smaller items, such as peanuts and passion-fruit pulp, have expanded considerably.

Crops grown commercially include coconuts, rubber, cocoa, coffee, rice and peanuts. Large quantities of fruit and vegetables are grown by natives for their subsistence and small amounts are produced commercially for local consumption. Other crops under investigation include tea, kenaf, manila hemp and sisal.

Rubber, cocoa and coffee trees take some time to come into bearing, but it is estimated that when all present plantings of these crops reach maturing, annual production will be about 4,000 tons of rubber, 5,000 tons of cocoa and 300 tons of coffee. More plantings are being encouraged and it is anticipated that production of cocoa and coffee, particularly, will increase further.

The territory supplies all Australia's requirements of copra (approximately 30,000 tons yearly) and the balance of production is sold at present under a nine-years' contract to the United Kingdom Ministry of Food. This contract, which expires in 1957, has given valuable stability in a market which before the war was subject to wide price fluctuations. The 1955 price is £81/5/- per ton f.o.b. territory ports. Incidentally, the industry provides approximately £6,000,000 in foreign exchange annually.

European plantations, with a planted area of 235,000 acres, together with numerous native coconut groves, now produce about 100,000 tons of copra a year, valued at nearly £8,000,000. It is estimated that 20 per cent. of total copra production is from stands owned by natives.

As a complement to the agricultural side of the industry, a copra-crushing mill for extraction of coconut oil has been established by a commercial organization at Rabaul in New Britain. This mill crushes 15,000 tons of copra yearly and produces about 9,000 tons of oil and 6,000 tons of meal for export. It has a capacity of possibly three times these quantities, but the present intake of copra is the maximum permitted by the United Kingdom Ministry of Food under the marketing agreement.

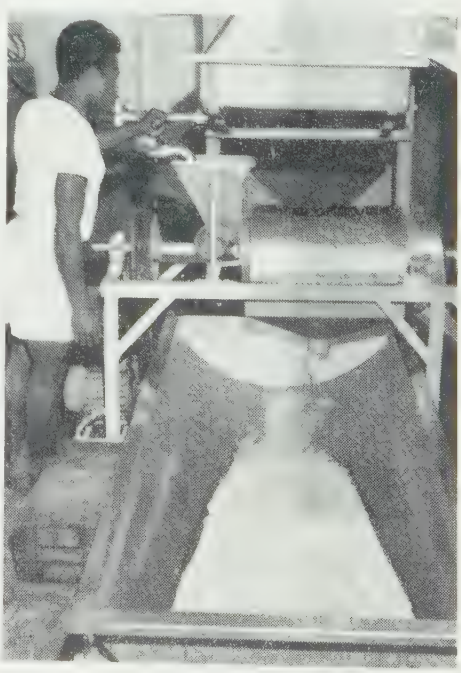
Exports of crude rubber have increased from 1,198 tons in 1948-49 to 3,592 tons in 1954-55. This is all produced in Papua. The bulk of territory output is bought by Australian rubber manufacturers who, in 1953-54, imported about 41,000 tons of rubber from all sources.

The plantation area under rubber in Papua in March 1954 was about 27,000 acres, located mainly in the Central and Northern Districts.

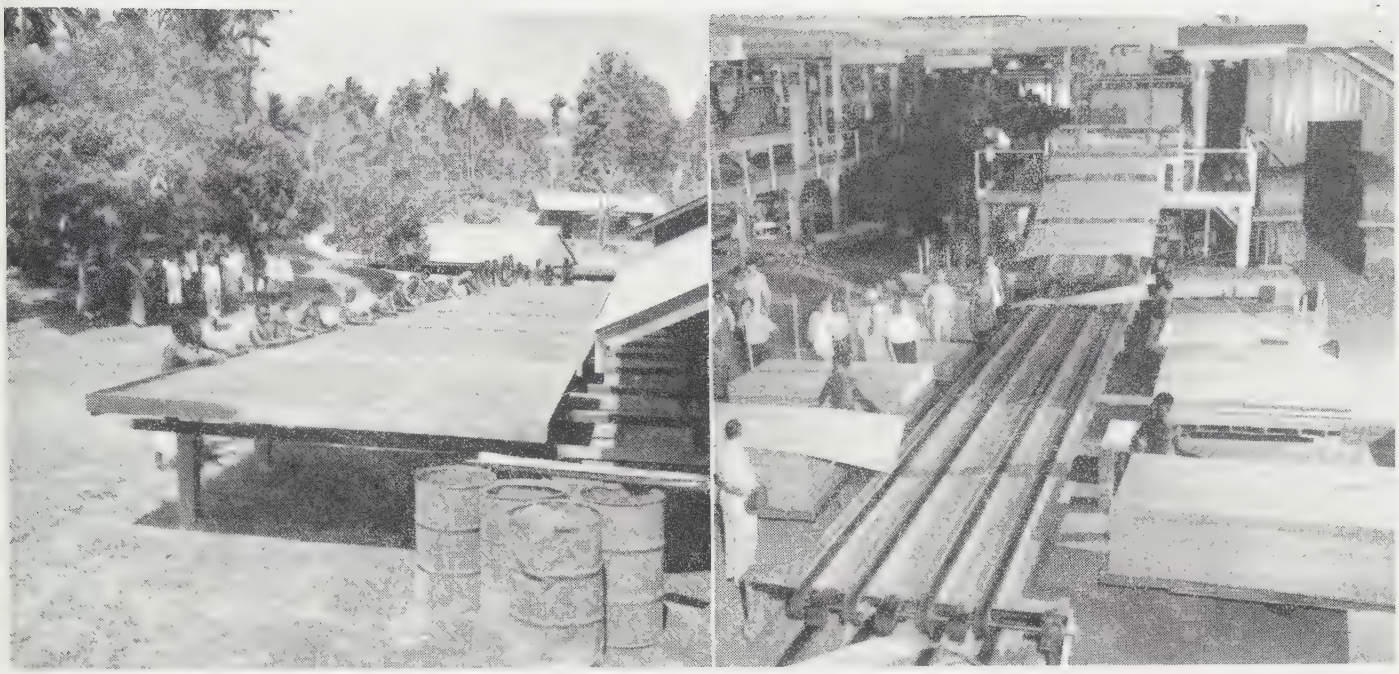
Planters are now assisted by the Administration to import higher-yielding planting material and a rubber experiment station is being set up in Bisianumu, near Port Moresby, where investigations into various aspects of rubber-growing will be carried out.

In recent years there has been a big increase in the planting of cacao trees from which beans are obtained. The area of cacao trees on non-native plantations increased from 7,831 acres in March 1951 to about 19,400 acres in March 1954. Exports of cocoa beans from the territory increased from 200 tons in 1948-49 to 1,106 tons in 1954-55 and it is estimated that, when all trees come into full production, exports should be about 5,000 tons yearly. In 1953-54, Australia imported 11,500 tons of cocoa. Natives have shown much enthusiasm for cocoa-growing, especially in the Gazelle Peninsula, where it is estimated they have planted over one million cacao trees in recent years.

Several settlers have planted coffee (in conjunction with other crops) in the highlands. There were 806 acres planted with coffee trees on European plantations in March 1954, and of this area 462 acres were not yet in bearing. Natives in numerous localities are also



Passion-fruit juice being extracted in a factory at Goroka. The passion-fruit is purchased from natives in the Assaro Valley, who were assisted by the Department of Agriculture to establish this cash crop. Exports of passion-fruit pulp and juice to Australia in 1954-55 were 97 tons, valued at £15,705.



Above: A view of the new native-owned cocoa sun-drying sheds at Pelegir fermentary, near Rabaul. Right: Visitors to the Commonwealth-New Guinea Timbers Limited plywood factory at Bulolo watching klinkii pine logs being peeled and clipped. Production is about 70 tons a day.

undertaking coffee-growing as a source of cash income.

Exports of coffee beans increased from 16 tons in 1948-49 to 106 tons in 1954-55. In 1953-54 Australia imported 4,300 tons of coffee.

The territory consumes about 11,000 tons of imported rice per year and encouragement and practical assistance has been given to natives to stimulate village rice-growing in order to reduce importations of this valuable commodity. More than 2,000 acres are now under dry rice.

Agricultural extension work in the Madang and Sepik districts and in the Mekeo area has aroused native interest in dry rice-growing in those areas.

Passion-fruit production has developed in recent years in the Central Highlands. Fruit is bought from native growers by a commercial organization and is pulped at Goroka for export to Australia. Exports of passion-fruit pulp and juice in 1954-55 were 97 tons valued at £15,705. Peanuts are grown by Europeans and natives for export and are also used by natives as a food crop. Exports of this crop increased from six tons in 1951-52 to 184 tons, valued at £27,628, in 1954-55.

Development Of Cattle Industry

It is aimed to make the territory self-sufficient in fresh and processed meats and dairy products. With this in view, encouragement is being given to importation of good quality cattle by planters and farmers.

War-time destruction reduced the pre-war beef cattle population of the territory from about 26,000 to a little more than a thousand. This number has now recovered to about 7,500. Approximately 100,000 cattle would be required to produce present territory meat requirements of about 15,000 beef carcases per annum.

A few commercial dairy farms have been established and several missions and settlers produce milk and dairy products for their own and for native consumption. Experiments being conducted aim at breeding a strain of cattle and developing pastures and husbandry methods more suited to the local climate.

Sheep-farming as a commercial industry in the territory is still at an experimental stage. Most of the sheep, numbering about 1,900, are at the Hallstrom Trust at Nondugl.

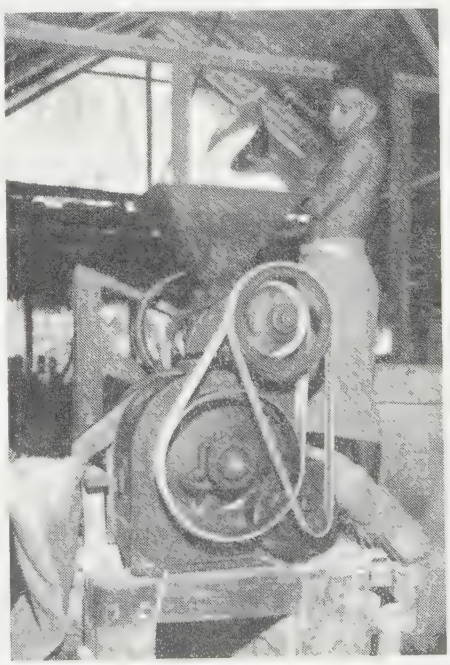
Natives produce large quantities of fruit and vegetables for their own consumption and some for sale to Europeans. However, some fruit and vegetables that could be grown in the territory are imported and, as with meat and dairy products, the aim is to make the territory self-sufficient in these items.

Most of the indigenous inhabitants, of course, are agriculturists, producing vegetables such as yams, taro and sweet potatoes as well as coconuts, bananas, pawpaws, maize, sugarcane, cassava, beans, peanuts, rice and tobacco.

Generally speaking, before the war almost all native commercial agriculture was concentrated in coastal regions and restricted to copra production. However, Administration guidance has brought a marked change, and natives are now keenly interested in cash crops of new and established varieties and are adopting new methods of land use in village gardens. The advancement of native agriculture takes a high priority in Government policy.

Extensive Research Programme Maintained

It is obvious, of course, that in a rapidly-developing country, where con-



A local co-operative-owned rice huller operating at Amele Village, near Madang, where extensive rice-growing experiments are being carried out.

ditions are eminently suitable for growing many tropical crops, there must be a continuous programme of research and investigation.

The Papua and New Guinea Department of Agriculture, which at present has a European staff of about 145, now carries out investigations at eight agricultural and seven livestock experiment and demonstration stations in the territory, and provides technical advice to native agriculturists and planters. The main agricultural experiment stations are at Keravat and Epo (lowlands), Aiyura (5,500-6,000 feet) and Garaina (2,200 feet).

Research at these stations involves studies of land use and soil fertility problems, as well as experiments of an agronomic nature with crops such as coconuts, rubber, cocoa, coffee, fibres, tea and native food crops. Work is also carried out on cover crops and on the suitability of introduced crops for European and native production.

In order to keep abreast of improved crop varieties the Department also maintains a plant introduction and quarantine station at Laloki, near Port Moresby.

Timber Industry Expanding Steadily

The largest single timber project in Papua and New Guinea is a joint Government-private enterprise company, Commonwealth-New Guinea Timbers Ltd., in which the Commonwealth Government, as a majority shareholder, is associated with Bulolo Gold Dredging Ltd. for the purpose of utilising enormous stands of excellent hoop and klinkii pine in the Bulolo Valley of New Guinea.

The joint company's modern £1,300,000 plywood mill at Bulolo was opened in January 1954, and production of high-grade plywood and veneers commenced. The company's product will not compete with, but will supplement, Australian production and will supply the territories' own needs and constitute a major export item. The mill is operating 24 hours a day, five days a week, and its production will amount to some 48 million square feet of 3/16" plywood per annum, or about 70 tons a day.

About 70-80 per cent. of the combined area of the two territories is well forested. Good hardwoods are not plentiful, but there are large stands of pines and other soft and medium woods. Since the war substantial expansion has taken place in the timber industry, particularly in New Guinea, and today, as well as supplying the bulk of local requirements, the industry exports large quantities of sawn timber, plywood and logs to Australian and overseas markets.

The Administration's Department of Forests has instituted considerable research in forest botany and nursery work, and maintains two sawmills of its own in New Guinea which are also used partly for training and research. It is keenly aware of its responsibilities in re-afforestation.

However, Government policy is primarily to encourage private enterprise development by submitting timber permits to competitive tender. Permit areas are necessarily large to enable successful tenderers to write off their developmental works (mainly access roads) against a sizeable volume of timber. One of the largest permits ever granted was a recent one involving 70 million super feet of logs in the Trans-Busa area, north-west of Lae in New Guinea.

Other major timber areas being opened to private enterprise are in Papua, at Sangara, inland from Buna, and the Brown River area close to Port Moresby. In the Gulf Division of Papua, the New Guinea-Borneo Mangrove Company has established an extraction plant for the manufacture of cutch (a preservative tannin extract) from the bark of trees in the very extensive mangrove forests in the Kikori and Purari River Delta area.

Testing latex on Koitaki plantation near Port Moresby to determine the dry weight of rubber per gallon of latex. Exports of crude rubber increased from 1,198 tons in 1948-49 to 3,592 tons in 1954-55. The Administration, which assists planters to import high-yielding planting material, is setting up a rubber experiment station near Port Moresby.

Gold And Silver Production

The most important mining activity in Papua and New Guinea is the production of gold and silver. The Morobe goldfield in the south-east of New Guinea is the main producing area.

Gold production (and associated silver production) centres mainly around the Watut and Bulolo Rivers and Edie Creek in the vicinity of the townships of Bulolo and Wau. The gold is mostly found in the alluvial wash of the rivers and creeks. Sluicing and boxing methods originally used have largely been replaced by dredge mining, which now accounts for 80 per cent. of total production.

The country of this region is of such a rugged and mountainous character that air transport was used in the early stages to transport all stores and other materials to the field. A road now connects with the coastal port of Lae.

Increases in mining costs have led to the two principal companies diverting portion of their resources to timber production. Unless there is a rise in the price of gold or a sharp drop in the cost of production, or unless new deposits are located, gold production is likely to fall further over the next few years. In 1953-54, output was 91,137 fine ounces valued at £1,414,265. Production of silver was 51,010 fine ounces valued at £18,420.

Small quantities of high-grade manganese battery ore are produced from Rigo, near Port Moresby in Papua. Minor deposits of osmiridium, platinum, copper and sulphur have been worked in the past, but only small quantities are now produced.

The search for petroleum has been carried on for many years and more than £15,000,000 has to date been expended in both territories. Although surface indications of the occurrence of oil are common in many areas, oil in commercial quantities has not so far been located. At present four companies hold petroleum prospecting permits over a total area of about 45,250 square miles.

Encouragement Of Private Enterprise

The expressed policy of the Government is to regard private enterprise (whether European or native) as the means of further development of Papua and New Guinea. It is clear, however, that in a territory such as this, private enterprise must be assisted as far as possible, and the Government acknowledges this responsibility. This consists in the provision of the roads, wharves, water and power supplies, communications, technical advisory services in agriculture and forestry necessary to enable private industry and commerce to function and the health, educational and other services which, in particular, are helping the native peoples to advance educationally and socially to the stage where they can make their full contribution to the general development of the territory.

Coastal and inter-island shipping services are carried on by twelve or more different organisations which provide a fairly complete service in the areas in

Native trainees at Erap Animal Breeding Station discuss young Berkshire-Tamworth cross pigs with the farm manager. In the territory there are seven livestock and eight agricultural experiment and demonstration stations which provide technical advice to native agriculturists and planters.

which they operate. Plantation owners, missions and other organizations also operate vessels for their own use.

Two lines (with nine ships) have vessels trading exclusively between Australia and the territory and other shipping lines trading with the East call regularly at Papua and New Guinea ports.

Since the war, wharves have been completed at Lae, Samarai, Port Moresby and Madang. The immediate programme is to complete a new wharf under construction at Rabaul, provide extensions at Lae and Port Moresby, and a cargo shed and ancillary works at Port Moresby and Kavieng.

The territory has about 175 aerodromes and seaplane bases. Sixteen regular air services operate and, in addition, the Australasian Petroleum Company is using helicopters in oil-prospecting operations.

Post Offices provide full postal and telegraphic facilities at 42 points in Papua and New Guinea, and radio telephone trunk circuits are in use between Port Moresby and Lae, Rabaul and Madang.

Internal telephone and radio telephone services are owned and operated by the Administration. All external circuits are owned and operated by the Overseas Telecommunications Commission of Australia.

Medium and short-wave programmes are broadcast to Papua and New Guinea from the Australian Broadcasting Commission's stations 9PA and VLT7 at Port Moresby.

No income tax (on income earned within the territory) or sales tax is levied in the territory. The main form of direct taxation is the imposition of export duties on certain commodities or royalties on timber and gold, and of import duties on goods brought into the territory. Necessities such as food and clothing and goods required for developing the territory are admitted duty free. Duty of 11 per cent. ad valorem is charged on most other goods, with higher rates for certain luxuries.

Government policy since the Second World War has involved expenditure of much greater sums than could be secured by local taxation, and the Commonwealth Government has accordingly made large annual grants. In 1953-54 the grant amounted to £5.4 million, local revenue being £2.9 million and expenditure £8.3 million. Estimates for 1954-55 were: Commonwealth grant £7.5 million, local revenue £3 million and expenditure £10.5 million.

Total exports amounted in 1953-54 to £11.1 million and imports to £15.1 million.

The principal export of the territory is copra, which in 1953-54 accounted for £7.4 million, or 66 per cent. of the value of all exports. Gold and rubber accounted for a further £2 million, or 15 per cent., whilst timber, cocoa, coffee, and peanuts at £400,000 made up 4 per cent. of the total. It can be expected that cocoa and timber will assume greater importance as exports in the next few years.

The main destinations of territory exports in 1953-54 were Australia and the United Kingdom, the former taking £5.2 million, or 46.7 per cent., and the latter £4.9 million, or 44.1 per cent. of the total value of exports. During the same year minor quantities were exported to Sweden, Japan and the U.S.A.

In 1953-54 more than £4.47 million, or 29 per cent. of expenditure on imports, was outlaid on machinery and metal goods, while the proportion of expenditure on importation of foodstuffs at £4.4 million was about 25 per cent.

The prospects are clear, but economic development is necessarily related to the educational and social progress of the native people. It is on this balanced development that the true greatness of the country will eventually be established.

PAPUA AND NEW GUINEA: PRINCIPAL EXPORTS

		1948-49	*1953-54*	*1954-55*
Copra and Copra Products	tons	46,383	98,000	92,224
	value	£1,964,494	£7,415,537	
Rubber	tons	1,198	3,145	3,592
	value	£145,973	£612,788	
Cocoa Beans	tons	200	727	1,106
	value	£36,413	£249,588	
Coffee Beans	tons	16	87	106
	value	£3,584	£60,211	
Minerals	value	£997,421	£1,434,257	N.A.
Timber	value	£23,207	£181,849 (including plywood)	£902,047
Trochus and Other Shell	value	£29,900	£209,090	£330,608

Preserving Primary Export Products In The Tropics

By E. J. E. LEFORT*

AGRICULTURE in the tropics is acquiring increasing importance in the world as a source not only of food for the inhabitants but also of products for export. However, climatic conditions in hot, damp areas are such that difficult problems often arise in the preservation of such produce. Lack of knowledge on this subject is the most common reason for the serious losses sustained by planters and exporters. As in all other underdeveloped territories, the South Pacific islands suffer from this gap in knowledge and are forced to pay each year the heavy toll taken of the fruits of their labour by parasites of all types. It is therefore felt that methods and means of protecting crops against attack by animal and vegetable pests and diseases might be usefully recalled.

A well-designed copra store at Koremari, Bougainville, built of rough timber and palm leaves. The floor is raised well above the ground and allows free circulation of air through the stored copra.

Before considering the question of protection and preservation of South Pacific agricultural products, it would seem necessary, in order to make quite clear the correct procedure for preserving crops in general, to give a brief account of conditions of infestation and the means likely to prevent or control them.

The essential condition in any type of parasite protection lies in reducing the many causes of humidity. Apart from the natural humidity of the product, which may be high if harvesting has been carried out under poor conditions, there are the accidental causes of water infiltration, either the result of inadequate storage or, more often, of extremely primitive coastal or inter-island transport. Products which are over-damp readily rise in temperature, thus giving further encouragement to infestation.

In order to ensure that they keep relatively well, vegetable products in general should contain less than 11% humidity and be stored in warehouses with a temperature below 59° F. Since it is difficult to produce these conditions in tropical countries, particular attention should be given to the question of preservation.

Correct harvesting or processing is not enough to ensure preservation; suitable depots are also necessary in order to store products adequately. Here, whether the storage place be large or small, cleanliness is an absolute essential. Every three months walls and paving stones should be whitewashed or treated by spraying with residual insecticides such as D.D.T. or Lindane, and cracks specially disinfected with turpentine after being scoured with a vacuum cleaner or compressed air. Whenever possible, cracks should be filled and wooden floors replaced by cement slabs.

An important source of contamination is in sacks, from which it is difficult to remove insects. It is possible, however, to rid jute packing material of vermin by steam sterilization or by disinfecting through soaking or fumigation. Nowadays, new sacks are often soaked in insecticide solutions which are both effective and long lasting. Paper bags treated in the same way are also employed and are destroyed after use.

It is obvious that the ideal method of preservation is by hermetic ensilage which gives unequalled protection, provided the crops are thoroughly dry.

Prolonged duration of storage always presents grave risks for preservation of products. Ill-effects are often prevented by shovelling, winnowing, transfer, sifting or stirring, which all tend to restrict insect reproduction.

However, mechanical measures will not destroy parasites on stocks of vegetable products completely, and it is necessary to use other methods. Adult insects are destroyed by raising the temperature to 122° F. for one hour, 140° F. for half an hour and 147° F. for a quarter of an hour. Sterilization by heat can be carried out in a variety of equipment, utilizing hot air, heated plates or infra-red rays.

Alternative Disinfection Methods

Disinfection is also carried out, depending whether it is superficial or deep, by using aerosol or fumigation.

The aerosol method, by gas or heat, ensures dispersion of extremely small particles of disinfectant. According to whether the latter is liquid or solid, the projected particles form a nebulization or a smoke. The cloud of liquid penetrates to a varying extent into the mass of the product, depending on its force, but never exceeds a few inches in depth. However, penetration can be facilitated by probing.

The fumigants act by vapour. There is a wide range of these products, but a detailed study of them is outside the scope of this article. Their effectiveness is generally in proportion to the dangers incurred in handling. In fact, the ideal fumigant has yet to be found: that is to say, a type which is a powerful insecticide without being inflammable, dangerous for the operator or likely to depreciate the market value of the goods treated. However, with certain precautions, fumigation is successfully carried

* Research Officer for Economic Development, South Pacific Commission.

Efficient drying of cocoa beans is essential to good keeping. This photo shows cocoa beans in a fermenting box where, covered by banana leaves, they remain about a week. They are then dried and bagged for shipment. Keravat Agricultural Station, Papua and New Guinea.

out with products such as carbon tetrachloride, dichloride, ethylene dibromide, hydrocyanic acid, ethylene oxide, propylene oxide, and methyl bromide.

Under normal pressure the effectiveness of fumigation is dependent, firstly, on the operating time, which should never be less than 24 hours, and, secondly, on the air-tightness of the storehouse, whether it be a silo or other receptable, and finally, on the size of the particles in the product to be disinfected (the smaller the spaces between the grains the more difficult it is for the fumigant to penetrate). It should also be added that spreading power is considerably reduced by agglomeration or sedimentation of mouldy or damp grains.

In storehouses where atmospheric conditions are poor, fumigation becomes an expensive and even useless undertaking. In this case, fumigating must be carried out under a canvas awning, or, better still, in a fumigatorium, a small room specially installed in which the stock can be treated in batches.

Disinfection under partial vacuum requires expensive equipment which can only be used by specialized firms. However, as this is obviously the method of the future, it will be described briefly here. This is the only technique which makes it possible to give complete treatment to products, whatever their type or the vermin which infest them. The partial vacuum set up in airtight chambers is replaced by a toxic atmosphere which varies in concentration according to the density of the products to be sterilized and the resistance of insects to the toxic fumes. Large quantities of products can thus be perfectly and swiftly disinsectised without any risk for the operator. Although at present this method of disinfection is generally used only in ports, it is to be hoped that it will spread to collective organization.

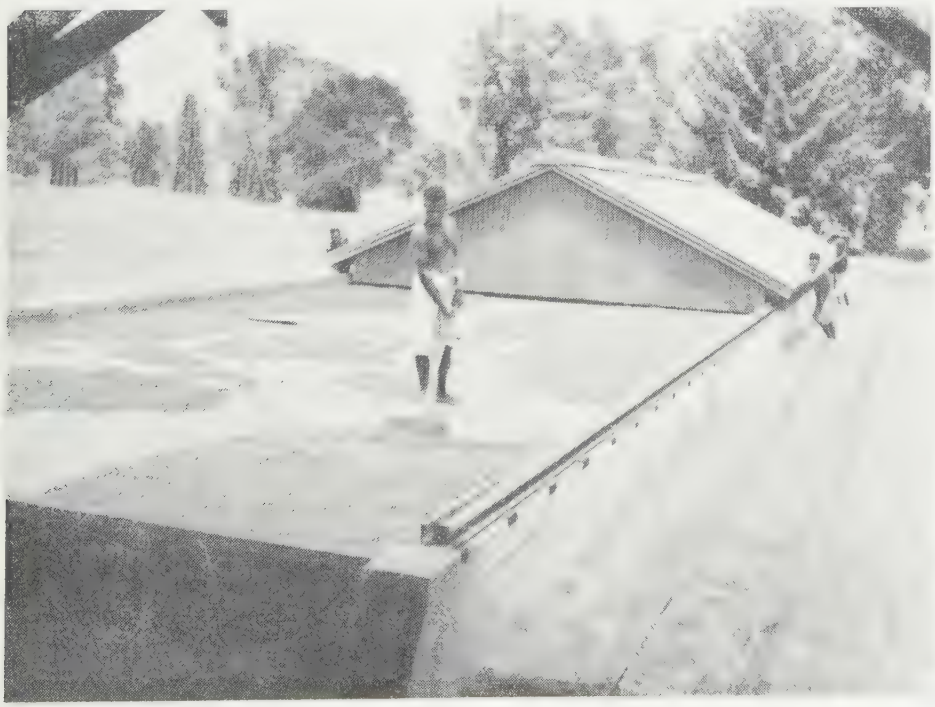
For adequate preservation, agricultural products should be protected at all stages of the commercial circuit, from gathering to consumption. Not one person but all concerned should take an active part in reducing losses caused through infestation by permanent supervision of stocks, whether they be housed in granaries, storehouses, silos or depots.

After this brief review of questions related to crop preservation, it would seem necessary to give further details on the means best suited to preserving the main agricultural products of the South Pacific.

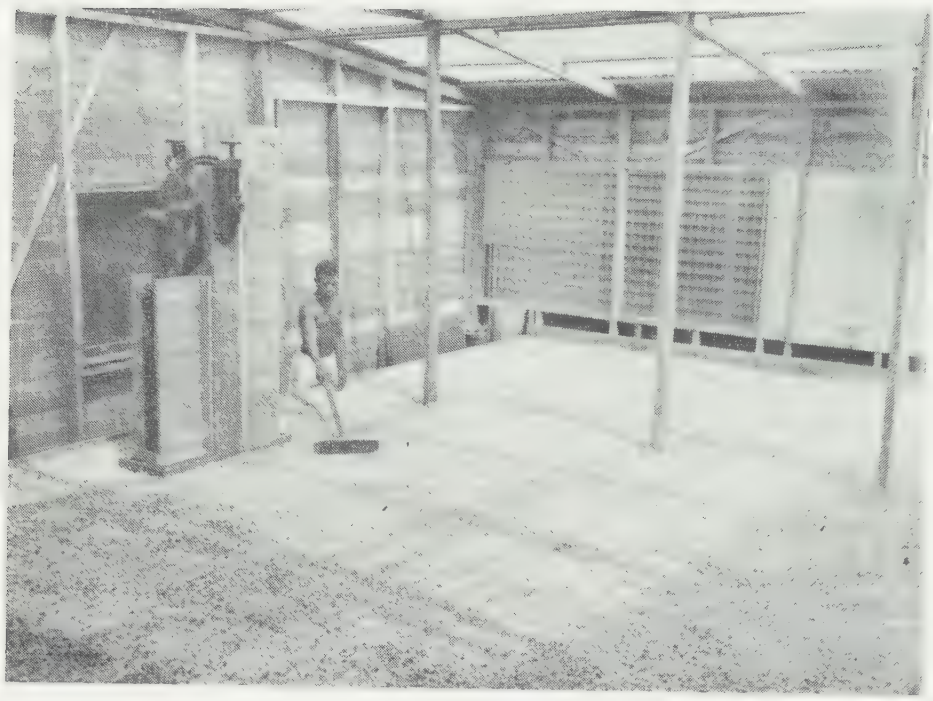
Preservation of Copra

Preservation of copra in the South Pacific is rendered difficult by such problems as harvesting, drying, transport, storage and conditioning. Until tangible results have been obtained in these different fields, the South Pacific will continue to lose enormous yearly sums on its staple product, copra. Let us briefly examine each of these problems.

Harvesting consists of allowing the nuts to fall naturally from the tree; this means that there is often delay in collection so that many nuts are already sprouting when brought for drying. The enzyme produced by the developing embryo attacks the cellulose and fat in the coconut meat, thus causing not only a considerable loss in weight, but also making drying difficult. The remedy is to collect the nuts early or to cause them to fall from the tree.



Sun-drier with sliding roof at Keravat Agricultural Station. Native staff are preparing to slide the roof over the tray. The worker in the foreground demonstrates how the dried cocoa beans are constantly turned during the drying process.



Problems encountered in preserving coffee are identical with those involved in cocoa preservation. This photo shows final drying of coffee beans under a perspex roof at Mr. J. Leahy's factory in the Highlands, Papua and New Guinea.

Manufacture of copra in the Pacific islands formed the subject of an excellent report by Mr. W. V. D. Pieris[1] and reference will be made to this in passing to show its interrelationship with preservation of the product.

Whatever the artificial method of drying employed, it is always advisable to remove the film of moisture which partially covers the freshly-extracted meat by leaving it in the sun for about 8 hours. If this film remains on the meat for some time, its surface becomes viscous, thus presenting a favourable environment for the development of mould and bacteria. Further, it would seem that this initial exposure to the sun has a bleaching and aseptic effect.

Some South Pacific planters are in the habit, especially in damp weather, of throwing powdered sulphur into the open furnace of their drier so that its fumes impregnate the copra, thus improving its keeping quality. Even if there is any foundation for this, such a practice should be discontinued, since the presence of sulphur in coconut-oil, even in very small amount, gives it a rubbery flavour which becomes very marked when it is exposed to the sun. It is better in this case to substitute coconut shells for the usual fuel; these give off phenol and creosote fumes whose disinfectant action is not harmful to the market value of the product.

When removed from the oven, the dry copra sweats if placed directly in a sack, thus acquiring the consistency of leather and making it more susceptible to mould. In all cases of artificial drying, the copra should be cooled before packing.

When dry copra is broken, the broken edge should be pearly grey in colour; the water content should not exceed 6%. If a white line is apparent in the middle of the crack it is a sure sign that the water content is too high and that the product is liable to attack from mould and insects. Any copra with this defect should automatically be returned to the drying room or undergo prolonged drying in the sun.

Good copra should be clean, white, thoroughly dry, with a good smell and no sign of discoloration or attack from insects or mould. It is certain that the latter can be restricted by using certain chemical products mentioned above, but I believe with Mr. Pieris that one of the best control methods lies in the adoption of proper drying procedures.

However, there is no point in manufacturing excellent copra if it is to be spoilt during storage. It is well known that planters and manufacturers generally possess only open sheds which, because of the surrounding humidity, encourage mould and depreciate the value of the copra even before it leaves the place of production. But what is less well known is that the large colonial trade warehouses are often scarcely better than these makeshift sheds.

Copra storehouses should fulfil the following conditions: they should be rainproof, the ground should be dry, preferably cemented, so as to prevent water from seeping in, the size should be in proportion to the tonnage stored, openings should be large enough for proper lighting and ventilation, there should be protection from rodents, the building should be free of all rubbish, be disinfected and disinsectisized as often as necessary and, finally, piles of sacks should touch neither the ground nor the walls and be sufficiently spaced to allow circulation of air.

If planters and stockists were to make a close examination of losses incurred by poor storage conditions for copra, they would soon realize, when actually faced with the figures, that the original saving effected in constructing a makeshift shed is completely fictitious and has, in fact, meant a definite drop in their income.

Problems of Transportation

The question of transport in the South Pacific is something of a challenge. In fact, although the groups of islands scattered between the Tropics of Cancer and Capricorn form an ecological entity favourable to the coconut, the fact that they are so widely separated is an uneconomical factor which can only be remedied by establishing adequate means of communication. When one considers that copra from more than 4,000 islands and atolls has to be taken off by canoe, steamer, whaler or schooner towards only 27 shipping centres possessing proper harbouring facilities, it is readily understood that the transport question is of major importance in the South Seas. The conditions of collection by sea are so primitive that even the cleanest and driest copra often arrives at the landing point soaking wet or mouldy. Further, it is not unusual for some of the outlying islands to have to wait eight months and more to load their copra onto inter-island boats. This long wait further accentuates the effects of generally poor storage, gives a product of poor quality which automatically contaminates superior copra lots loaded along with it. Let us add also that there is an increasing tendency to transport in bulk, thus increasing the possibilities of infection. This is also true of the mail boats which, having loaded products already deteriorated by storage, arrive at the import centres with copra which is infested, discoloured and soiled by quantities of dead insects and excreta.

Admittedly, the problem of transport is not a simple one, but a solution must be found to this question as to those of the manufacture and storage, since it is vital for the South Pacific to raise the quality of its coconut oil to compete with the solid oils on the international market. To us there seems no other

[1] **The Manufacture of Copra in the Pacific Islands.** SPC Technical Paper No. 82.

means possible to attain this object than to assemble all production units under some efficient collective form: co-operatives, planters' associations, agricultural unions, etc.

The tendency of the copra market to selectivity implies a serious effort towards standardization on the part of the producing countries. It so happens that the United States and France use coconut oil only for soap manufacture and therefore buy both poor and good copra at the same rate. In these conditions it can be readily understood why Pacific producers make no effort to obtain better qualities of copra. Fortunately, the other metropolitan countries which administer the South Pacific islands utilize copra for food purposes and are prepared to pay for it in accordance with its quality. This encouraging attitude offers definite prospects for establishing regional conditioning regulations with simple uniform standards to cover all territories. A system of bonuses and rebates would certainly have an excellent effect on the quality of copra. Given encouragement, planters would do more than merely listen to advice on improving their products; they would apply it. Preservation of copra in the South Pacific is a many-sided and complex problem which can only be solved by establishing quality standards which will in their turn necessitate rigid observance of correct techniques. The development of the market in solid oils suggests that this moment is not too far away.

Cocoa Preservation

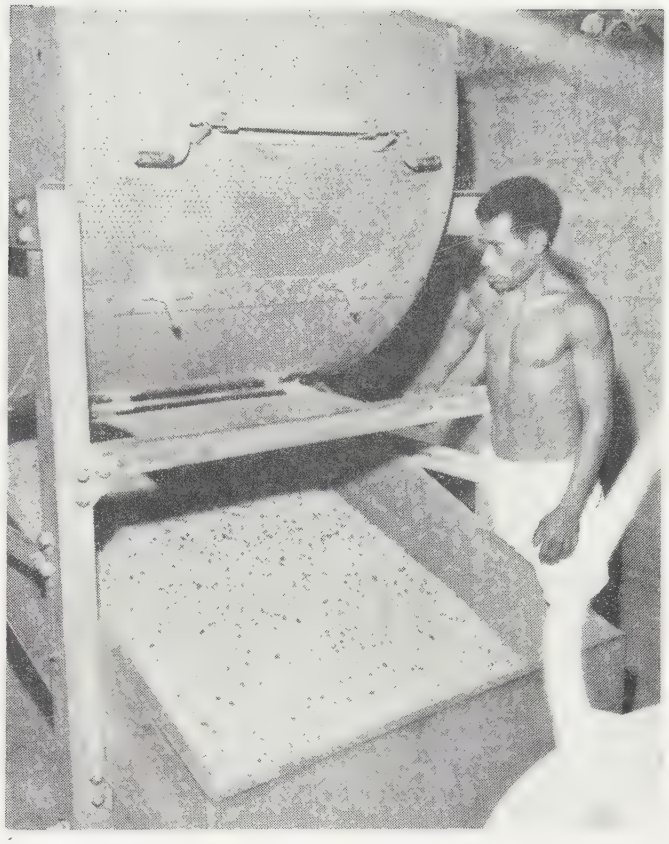
Cultivation of cocoa, which is a rising product in the South Pacific, is localized because of its ecological and climatic requirements, and problems of marketing are consequently considerably reduced. Therefore, unlike the case of copra, such problems have relatively little bearing on its preservation.

But, it is more important for cocoa than perhaps for any other product that the water content be checked as it enters storage. The optimum rate for good keeping is between 6 and 7%. A lower percentage causes increased brittleness of the shell without any disadvantage in return. However, the water content should not exceed 8%; beyond this there is the risk of mould and insect attack

So as not to extend this critical point, it is essential to devote careful attention to conditions of drying, transport and storage.

When climatic conditions do not make it possible to dry in the sun, either on sheltered areas or moveable trays, artificial drying should be carried out with either static or continuous dryers.

During road transport rain is the chief enemy; whilst loading on to schooners or mail boats, when necessary, involves the risk of salt water entering the lots. In both cases a canvas covering will protect the cocoa.



A native attendant checking the flow of coffee beans from a rotary drier in Mr. J. Leahy's factory.

In the case of land transport, a few elementary precautions might be taken. For instance, lorries might travel uncovered during the daytime when circumstances are favourable to drying, and covered when they became unfavourable —in rainy or misty weather or overnight. Unfortunately, it is unusual for convoyers to take such precautions, and very often they arrive at the storehouse with wet sacks which invariably communicate their dampness to the cocoa already stored, thus increasing the chances of mould. At this stage, the best measure to take would be to test the humidity of the bean and, if this is too high, to reduce it to a normal level by re-drying.

What has been said about storing copra applies equally to cocoa. Preservation conditions are generally defective from the moment of production until loading. Both small and large storehouses present the same disadvantages, in varying degrees: they are often too small in relation to the stock stored, badly protected from entry of water, inadequately provided with openings, badly situated in relation to dry winds, without gratings to protect the sacks against ground humidity, rarely cemented, without protection against rodents, dirty, often infested and rarely disinfected, etc., etc. In such conditions it is readily understood why the cocoa beans, generally insufficiently dry, should tend to spoil rather than improve in quality.

However, in most cases the humidity inside the warehouse is lower at nighttime than it is outside. The result is that by increasing ventilation during the day and discontinuing it at night, it is a simple matter to maintain a balanced atmosphere for cocoa whose relative humidity is 82% for a water content of 8%. A hygrometric recorder is useful here; by giving the relative ambiant humidity, it indicates whether this should be lowered by ventilation or whether, on the other hand, it is necessary to re-dry certain lots or send out others more rapidly.

On the subject of ventilation, the situation of the warehouse is important. In fact, the measure of its effectiveness for preserving cocoa is primarily that all openings should face dry or wet winds and, secondly, that there be internal facilities for ventilating from the ground upwards, hot air escaping through vents placed in the upper part of the building. To allow the air to circulate freely, the piles of sacks should be placed on gratings away from the walls, and passage-ways should be left between them to facilitate handling.

It would seem then that in normal circumstances it is possible to obtain sufficiently dry cocoa by making wise use of atmospheric conditions. However, for forwarding agents wishing to avoid damage to beans during storage or sea-transport, the use of perfected mechanical dryers is to be recommended.

The cost involved in this artificial preventive drying is more than compensated for by the lessening in risks of serious damage or of arbitration at the port of destination.

Insect control is effected, on the one hand, by keeping humidity in the storehouses below the critical level and, on the other hand, by the protective measures recommended in the first part of this article. However, let us add that it is mainly the broken beans which ensure the continued existence of the insects in the sacks. Whole beans are seldom attacked, and, if kept apart from sprouting, washed and broken beans, insects would completely disappear.

Another aspect of cocoa preservation is the rapidity with which it absorbs foreign odours. Those which are most readily retained by fats are the most persistent in cocoa; they not only lessen the value of the product, but sometimes even render it useless. Hence the importance of storing cocoa away from any product with a strong smell.

All methods likely to help in producing a fair merchantable cocoa are almost always of a preventive nature. By the time one has realized that storage conditions are ineffectual, it is already too late to intervene to any purpose. It is before such a situation is apparent that measures should be taken to avoid damage to the product. These measures will be briefly described here, illustrating to planters and stockists that their combined efforts are essential to ensure preservation of cocoa.

Harvesting should be more selective and consequently carried out more frequently. This would not only increase the amount of marketable cocoa, but would also decrease the proportion of over-ripe or rotten pods which are a cause of mould. It would also be more economical to open the pods with a mallet rather than a matchet; the latter damages a quantity of beans, thus making them more receptive to infection.

Immediately after harvesting, only beans from ripe and healthy pods should be sent for fermentation. Defective pods should be opened separately and the beans fermented apart. This is the best method of obtaining a product which will store well.

Fermentation in large lots, homogenised by stirring and correctly timed, prevents moulds from multiplying.

Whatever the method of drying employed, it should be capable of reducing the water content of the bean to less than 8%.

Precautionary Measures During Transport And Storage

Let us recall that cocoa should never be transported by night or in wet weather without covering, and that it should be stored in properly-installed, well-situated and rationally utilized buildings. Let us also add that cocoa storehouses should only be used for cocoa and that only new sacks should be used for packing, preferably lined with paper impregnated with insecticide (naturally free of smell) as an added protection against attack by insects and also as a means of avoiding possible reabsorption of humidity.

The technical advice given above can only be of use if it is given the backing of administrative action in the form of agricultural extension work, supervision of production and storage places, establishment of processing (artificial fermentation and drying of cocoa), transport and even storage (silo) co-operatives, and, finally, the enforcing of regulations providing for bonuses and rebates according to the grades of cocoa offered. Not only should the necessary means to obtain quality be available, but due reward should be given for the extra effort that quality implies. Without such measures, neither the planter nor the trader has much chance of obtaining tangible results.

Coffee Preservation

As in the case of cocoa, only a few South Pacific islands engage in coffee production, so that inter-island sea transport is a less important aspect of its preservation. The problems encountered in preserving coffee are identical with those involved in cocoa preservation, with the sole difference that the latter is more susceptible to damage from long storage than the former. In view of this similarity, only preventive technical measures for ensuring good storage of coffee will be considered in this section, and the reader is referred above for all aspects concerning control and organization, whether during transport or storing or on the administrative level.

Coffee is generally harvested with insufficient care. A mixture of red, green and black berries should be avoided. The black berries, often attacked by the coffee-borer (*Stephanoderes hampei*), require several gatherings and special collection. Further, in order to interrupt the borer's cycle of development in cases where the plantation consists of only one variety, all shrubs should be stripped at the end of each coffee season, leaving no fruit either on the shrubs or the ground. Direct control can be undertaken by using insecticides—Enderin, Dieldrin, Lindane and H.C.H. are all effective against this parasite.

Coffee processing by the wet method eliminates the coffee borer either by removing the black berries which float to the surface at the outset, or by the subsequent fermentation in water for 36 hours, which is sufficient to kill the insect. Dry fermentation is not to be recommended, since the lots dealt with are rarely large enough or sufficiently stirred for the operation to be successful. Fermentation occurring unevenly, the centre of the heaps of berries is burnt, whereas on the outside there is only a slight increase in temperature; this encourages the activity of the borer and its destructive effect continues, not only during drying, but also in the storehouse.

When coffee is processed by the dry method, it is preferable to scald the berries for several minutes before placing them on the drying area, as a method of borer control.

At the end of the drying process, whether natural or artificial, the humidity rate should be no higher than 13% if the coffee is to be marketable. A higher water content often leads to increase in moulds, if the coffee is neither fanned nor stirred, and sometimes to post-fermentation, which seriously affects its quality. It would definitely be advisable not only to recondition the coffee, but also to undertake re-drying before storing whenever this proves necessary.

Let us conclude by stating that it is, in fact, fairly easy to obtain dry coffee by making good use of atmospheric conditions, and that it is no more difficult to eliminate the borer by the above-described methods. Finally, the fundamental factor in preserving coffee lies mainly in the techniques and carefulness of the planter.

Rice Preservation

Rice-growing shows excellent prospects of extension in certain South Pacific territories, more particularly Fiji, Australian Papua and New Guinea and Netherlands New Guinea. However, rice production in these islands gives rise to a number of problems, not the least being preservation of the product. This problem, which is of particularly topical interest for the South Pacific, could be solved by applying the preservation methods commonly employed in the large rice-producing countries. The broad lines of these methods will be described here:

When harvested, paddy has a water content which varies between 20 and 28%, whereas it should not exceed 14% for storage and 13% for export. Drying is therefore necessary, either by natural or artificial methods.

When harvesting is done by hand or with the binder-harvester, the paddy can be dried in sheaves in the sun, provided the weather permits. In the contrary case, or when harvesting is carried out by the thresher-harvester, the paddy can be dried either on sheltered areas, with repeated shovelling or by artificial methods. The latter method is becoming increasingly popular in modern factories, since it is more speedy, requires less labour and can deal with larger quantities of grain. In view of these advantages, it is to be particularly recommended for rational paddy drying in hot, wet tropical areas.

Drying should be carried out at low temperature and fairly slowly so that

the grains retain their germinative power and do not split. The process is divided into a number of operations. The number of times the paddy requires to pass through the dryer, the duration of these operations, as well as the temperature of the hot air vary with the type of apparatus used, the hygrometry and temperature of the surrounding air, the variety of rice, the initial degree of humidity in the grain and the final water content required. For paddy containing from 20 to 23% of water, 3 or 4 operations are generally allowed, each taking half an hour and at a temperature varying between 109 and 113° F., followed by cooling. However, for drier grain temperatures can be higher, but should never exceed 131° F.; the paddy itself should never rise above 110° F. in order to ensure correct processing.

Static And Continuous Dryers

There exist two types of dryer—static and continuous. The latter, which has a high output, is most frequently employed. It is made up of a vertical cylinder in which the grain revolves downwards and in a current of hot air which gradually removes its humidity. These machines invariably give good results provided drying is properly carried out.

When the rice is harvested directly into sacks it requires special drying over a hot-air vent. The piles of sacks should be turned over several times during the drying operation so that the grain attains the desired rate of humidity.

A recent development is preservation of damp grain by mass winnowing in the silo. This new idea would not only make it possible to store the paddy without risk immediately on harvesting, but would also ensure slow drying. It is essential that silos be completely airtight.

A process of winnowing with dehydrated air, used in England, would have definite advantages for tropical areas. The air, passing through a drying column, rapidly dries the paddy to the desired degree and, what is more, can be easily renewed.

In the United States it is possible to preserve damp paddy by chemical methods. The grain, impregnated with propyleneglycol dipropionate or dimethyl-dichloromethylbenzene, can be stored after three days' treatment.

Mention should also be made of the recent method of spraying herbicide a few days before harvesting: this seems to be giving conclusive results in America. It would result, firstly, in more even ripening and, secondly, in a considerable reduction in the humidity content of the grain at harvesting. This latter advantage would lead to a marked economy in drying.

When drying is carried out in the sack no difficulty is encountered in storage. The only drawback is in the price of packing materials and labour for handling.

For mass drying of rice, the silo with some winnowing devices is essential, occasionally combined with periodic stirring of the lots of grain. However, metallic or concrete silos involve much outlay of capital and preservation is a delicate matter, although, on the other hand, protection against rodents and insects is easily ensured.

A happy medium might consist of constructing wooden cells with a metal framework combined with a system of preservation—drying by winnowing. This method would not only lead to a reduction in investments, but also obviate the need for driers, thus facilitating preservation and reducing costs. It should also be noted that depreciation occurring in rice not dried within 48 hours of harvesting would no longer exist.

As in many producer countries, rice preservation, which implies extensive capital outlay and advanced technique, might be undertaken in the South Pacific on a co-operative or some other collective basis.

In conclusion, here are a few simple principles essential for proper rice preservation: permanent cleanliness of warehouses or silos, periodical disinfection as well as fumigation when necessary, proper drying of the grain (12% humidity seems to be the optimum), separation of lots of paddy according to origin and, finally, rotation of outgoing batches in relation to duration of storage or ensilage, the oldest batches being despatched first.

It should be added, however, that the preservation of food products is a branch of technical activity and that large rice-storing undertakings will find it advisable to have a specialist in the matter available.

•

In tropical agriculture today, carefully-studied and easily-applied methods are now available for the protection of crops. However, I repeat, and conclude on this note, that preservation of agricultural products can only be ensured if properly directed, at all stages from harvesting to processing, by permanent supervision of stocks.

BRUNETEAU, J.: La conservation des denrées alimentaires stockées. Bulletin technique d'information des Ingénieurs des Services Agricoles, No. 49, April-May, 1950.

BRUNETEAU, J.: La protection des produits végétaux stockés. Etudes d'Outre-Mer. October, 1954.

EASTER, S. S.: Infestation Control in Stored Rice. Tropical Agriculturist, Agricultural Journal of Ceylon. Vol. CX, No. 3. July-September, 1954.

MARCHAND, P.: Les conditions du transport maritime des fèves de cacao. L'Agronomie Tropicale, No. 5. September-October, 1954.

PIELLARD, M.: Le conditionnement du cacao des Territoires d'Outre-Mer. L'Agronomie Tropicale, No. 5. September-October, 1954.

PIERIS, W. V. D.: The Manufacture of Copra in the Pacific Islands. Technical Paper No. 82. South Pacific Commission, Nouméa, New Caledonia.

PUJOL, G.: Le séchage, le stockage et l'usinage des riz. Bulletin d'information des riziculteurs de France, No. 21. July-August, 1952.

RENAUD, R.: La qualité du cacao—Les moisissures des fèves fermentées L'Agronomie Tropicale. No. 5. September-October, 1954.

SAENZ LOSCANO (Mme): Rapport sur les essais de ventilation du paddy ensilé effectués en décembre 1950. Archives de l'office indochinois du riz, Saigon. No. 35. 1951.

THOMSON, A. G.: Grain drying in tropical countries. World Crops. Vol. 6, No. 4. April, 1954.

WADSWORTH, R. V.: The quality of raw cocoa as it affects the manufacturer. Tropical Agriculture. Vol. 32, No. 1. January, 1955.

Second International Coconut Conference

A UNIFIED international coconut research scheme will be established in Ceylon with the assistance of the United Nations and the Food and Agriculture Organization immediately after the second International Coconut Conference is held in Ceylon early next year.

The research institute that will be set up will make a survey of coconut acreage and production in the producing countries, study the marketing problems relating to coconut products in all producing countries in the world, and carry out a co-ordinated research programme in the various regions.

The Conference is being sponsored by the Ceylon Coconut Board. Representatives will attend from the Philippines, Indonesia, India, Pakistan, Malaya, Singapore, Seychelles and the Pacific Islands. Observers have been invited from the United Kingdom, the United States, Australia, Belgium, China, Denmark, Italy, Japan and the Netherlands.

Delegations will also be sent from the Food and Agriculture Organization and the United Nations specialized agencies, Economic Commission for Asia and the Far East and the International Labour Organization.

The Conference is to be in two sessions, the scientific research session and the plenary session.

The first will be held on February 25 at Bandirippuwa, the headquarters of the Coconut Research Institute, and will be opened by Mr. Phillip Gunawardena,

(Continued on Page 48)

The Mechanization Of Timber Extraction

Mechanization can greatly facilitate timber-getting in many tropical regions, where labour is scarce and dear, and dwindling forested areas are becoming more and more difficult of access.

By E. J. E. LEFORT*

Timber - getting in Netherlands New Guinea, where the industry is being actively developed.

TIMBER extraction in tropical forests is no longer a luxury operation in which profit far exceeds outlay. Colonial woods have become "common" woods, and are the object of trade rivalry such as was rarely witnessed before the war. It is for this reason that loggers are seeking to use rational mechanization in order to cut down as far as possible the costs of certain stages of production in which there is still room for improvement. This is even more important in tropical regions where labour is often scarce and expensive, and it is becoming increasingly necessary to operate in areas difficult of access.

The problem of mechanizing timber extraction varies very considerably in its aspects, depending on the size of the undertaking, its financial situation, availability of equipment, nature and relief of the terrain, type of forest, distances to be covered, means of outlet, personnel in charge, native labour, local customs, etc. For this reason the question will be considered here from the general viewpoint only. However, the possibilities of mechanization will be indicated for each of the stages of production.

PROSPECTING: This is necessary for surveying stands and planning roadways. Aerial prospecting assists considerably in drawing up a logging programme. This is often supplemented by photographs which, when in colour, indicate more accurately the presence of certain timbers according to colour of foliage.

Opening up of strips is done at present with brush cutters of various dimensions, which work very rapidly. Clearing of undergrowth is also facilitated by the use of mechanical hand equipment, both light and easy to handle, of the "moto machete" or "coupe girafe" type, fitted with a circular saw fixed on to the end of a shaft, thus making it possible to cut at any angle required. These adjustable saws are sometimes attached to a kind of two-wheel motor cultivator of the "little giant" type.

FELLING: This is carried out with mechanical felling saws, which, by reason of their high output and easy handling, effect a considerable saving in labour. These include chain saws, arc saws and frame saws, which all give excellent results, although the first type is fairly dangerous to handle. In tropical areas where many trees have a wide flare, the arc is commonly used for felling.

Improved hydraulic wedges at present make it possible to complete felling operations much more rapidly than with ordinary wedges. They are also less dangerous.

CUTTING OFF: Both ends of the trunk are generally cleaned off by hand. Cutting off can be started on the felling site, but is normally carried out on the loading ground. This operation is carried out as far as possible with the mechanical cutter.

In the case of delicate work, where skill in handling is more important than yield, the cross-cut saw is used. Working conditions often allow only semi-mechanization.

STRIPPING, REMOVAL OF SAPWOOD: Certain varieties are sold with only their bark or sapwood removed. This work, which is always done by hand, is becoming increasingly costly in view of modern labour requirements. In order to reduce production costs an attempt at mechanization is made by using hammer-picks fitted with wood-working tools. Mechanical equipment is used which does not require a compressor unit. Results obtained in Europe are satisfactory, and deserve a trial in tropical areas. This method can also be extended to squaring.

PRESERVATION: The preservation of tropical rough timber is greatly helped by the use of multi-purpose preservatives, which are both fungicide and insecticide, and are applied by spraying. Splits and cracks in terminal sections are prevented by fitting snake fasteners and treating with a coating of some anti-split preparation.

HAULING OUT: Hauling out represents an important part of timber extraction; it should, therefore, be restricted to the shortest possible distance. The equipment used for this operation is either

(Continued on page 46)

* Research Officer for Economic Development, South Pacific Commission.

The Social Development Section of the Commission has recently collected information on broadcasting in the Pacific, in response to an enquiry from one of the territories and also in connexion with the clearing-house service for Pacific broadcast recordings, which has just come into operation. This service aims at providing an additional source of programme material for broadcasting stations in the Commission area, by distributing recordings on disc and tape of Pacific islands music.

The information given below on broadcasting in American Samoa, Fiji, Netherlands New Guinea, New Caledonia, Tahiti, Guam, Papua and New Guinea, British Solomon Islands Protectorate, Trust Territory of the Pacific Islands (under United States administration), and Western Samoa has been supplied either by the broadcasting stations themselves or by the Administrations; the information on the remaining territories in the Commission area has been obtained mainly from Annual Reports.

The entrance to Broadcasting House, Suva. In Fiji the broadcasting service is controlled by the Fiji Broadcasting Commission, which was established in 1954. It is a statutory body independent of Government control.

Broadcasting In The Pacific

AMERICAN SAMOA. Broadcasting station WVUV at Pago Pago, which has a 50w. transmitter operating on a frequency of 1120 kc/s, is controlled by the Office of Information and Adult Education, a division of the local Administration. WVUV broadcasts from 7 a.m. to 9 a.m. and from 6 p.m. to 9 p.m. from Monday to Friday, and about ten hours of this time are devoted to information programmes. Tentative plans call for weekend programmes to run from 7 a.m. to 4 p.m. on Saturday, and from 10 a.m. to 2 p.m. and 4.30 p.m. to 7.30 p.m. on Sunday. The station will then broadcast for a total of 41 hours per week.

The Office of Information and Adult Education has contributed to the clearing house service for broadcast recordings two half-hour programmes (on tape) of choral music performed by Samoans.

BRITISH SOLOMON ISLANDS PROTECTORATE. The broadcasting service began in 1952, and transmissions are made daily except Sundays, from 6-7 p.m. (0700-0800 G.M.T.). On Wednesdays the transmission period is one and a half hours, to provide a special programme for the Solomon Islanders. The 400 w. station VQO is situated at Honiara and broadcasts on a frequency of 1030 kc/s, simultaneously with an experimental shortwave transmission on 5960 kc/s from the 100 w. station VQO2. The languages used for broadcasting are English and Pidgin English.

Programmes consist mainly of recorded music, local news bulletins, including daily weather and shipping information, talks, and musical items by local talent. Recorded programmes average about 5 hours per week, "live" broadcasts 1 hour, and news and Government broadcasts 1 hour. The purchase of additional records was made possible by a Colonial Development and Welfare grant, and B.B.C. transcriptions are also received.

Solomon Islands listeners are particularly interested in recordings of island music, such as the discs prepared by Mr. G. B. Milner, of the London School of Oriental and African Studies, and the tape recordings of local performers made by the broadcasting station. Copies of Mr. Milner's discs are available through the Commission's broadcast recordings clearing-house service.

Some community listening sets are in operation in the territory, and Government district stations, mission stations and a number of privately-owned receivers are made available for community listening. In 1955 150 wireless listeners' licences were issued, the annual licence fee being £1.

The broadcast station has no separate staff and is operated by the Posts and Telegraphs Department staff and the Secretariat Officer responsible for Public Relations, in addition to their other duties. It is hoped to extend broadcasting hours when additional staff can be made available.

COOK ISLANDS. The broadcasting station at Rarotonga operates on a frequency of 5050 kc/s. It is controlled by the Radio Department and uses material supplied by the Education Department. The programmes consist of news and entertainment for half an hour each Wednesday from 6.30 p.m. In the Commission's clearing-house service there is a tape recording of a half-hour programme of Cook Islands songs which was broadcast over Rarotonga Radio.

Radio New Zealand, the shortwave station of the New Zealand Broadcasting Service, broadcasts nightly to the Pacific area, and the programmes sometimes feature items relating to the Cook Islands.

FIJI. The broadcasting service is controlled by the Fiji Broadcasting Commission, a statutory body independent of Government control. The Commission was established in 1954, and a new, modern, air-conditioned Broadcasting House was erected in Suva. Prior to this date, there had been a 400-watt commercial broadcasting station, ZJV. The new Broadcasting House was provided out of Colonial Development and Welfare funds, and finance for the operation of the Fiji Broadcasting Commission comes from Government grants, licence fees and advertising.

The authorized broadcast channels are:—

VRH	2 kw. on	930 kc/s
VRH-2	500 w. on	840 kc/s
VRH-4	500 w. on	3980 kc/s

Daily transmissions are made as follows: 6.30-10.00 a.m.; 12.00-2.00 p.m.; 4.00-10.30 p.m. Mondays to Fridays. 6.30-10.00 a.m.; 12.00-11.00 p.m. on Saturdays. 8.00 a.m.-10.15 p.m. on Sundays.

Simultaneous broadcasts in English on VRH and Hindustani on VRH and VRH-4 are made on Monday, Thursday and Saturday mornings from 6.30-7.30

A group of Indian school children recording an item on tape for a Hindi programme over Suva Radio.

A Fijian choir broadcasting in the main studio at Suva. At left is Josua Bogidrau, Public Relations Office newscaster in the indigenous tongue.

a.m. and 8.00 a.m.-9.30 a.m. on Sundays. Similar broadcasts take place during portion of Monday, Wednesday, Friday, Saturday and Sunday evenings. The main Fijian language broadcasts take place on Tuesdays from 7.00-9.00 p.m.; Thursdays from 8.30-9.30 p.m., and Sundays from 3.30-4.45 p.m. A number of half-hour sessions in Fijian and Hindustani are broadcast during daytime transmissions.

Programmes are provided in three languages—English, Fijian and Hindustani. The average weekly broadcasting hours for the three types of sessions are:

English	81.30 hours
Fijian	5.30 hours
Indian	12.00 hours

The allocation of time for the main types of programmes in English in an average week in 1955 was as follows:

Serious music	14.7%
Light music	49.6%
Dance music	7.3%
Plays, etc.	8.0%
News and commentaries	5.9%
Documentaries	2.7%
Religious broadcasts	4.2%
Children's sessions	2.0%
Talks	3.6%
Sport	2.0%

Fijian sessions have increased in variety considerably. There is no recorded Fijian music of any consequence, and the Commission has been restricted in recording from outside Suva because of a lack of suitable tape recorders. A number of portable recorders is due for delivery in September, 1956, when the Commission will extend recording activities into the villages. An analysis of one week's non-commercial programmes in November 1955 is as follows:

Local and world news	24%
Talks and discussions	18%
Children's sessions	4%
Sports	4%
General musical programmes	24%
Semi-religious (Sundays)	20%
Church services	6%

Indian sessions have increased in variety and scope since the appointment in November 1955 of a Senior Programme Assistant with Indian University qualifications. Considerable quantities of recordings ordered from India are now appearing in the daily programmes. An analysis of a typical week's non-commercial programmes in November 1954 is as follows:

Local and world news	20.5%
Popular programmes	16.5%
Talks and discussions	16.5%
Children's sessions	16.5%
Religious broadcasts	9.0%
Local artists' recitals	16.5%
Sport	4.5%

It is hoped that a fourth transmitter, a medium wave 2,500 w. unit, will be installed and operating at Lautoka on the north-west coast of Viti Levu by November 1956. This transmitter will be fed from Suva by a Very High Frequency chain of repeater stations.

The Commission will then be in the position of broadcasting simultaneously in two languages, with full Colony coverage in each. Programme schedules will be changed considerably to meet the new conditions.

Broadcasts to schools began in a small way early in 1956, and increased to approximately one hour per week in the second term. The Department of Education appointed a Broadcasts-to-Schools officer in June 1956, and a considerable increase in these broadcasts is expected by the beginning of 1957.

The Commission has a record library of approximately 10,000 standard recordings, 3,000 B.B.C. transcriptions, and several thousand recordings from two special overseas subscription libraries. A further 6-8,000 units are expected to be added to the library before the end of 1956.

Running expenses of the three-language service in 1955 were £35,066 with a net capital expenditure of £2,195. Commercial advertising gave a net revenue of £20,780, the remainder of the running costs coming from Government grant in lieu of licence revenue.

There were 11,300 receiving licences in June 1956, but the Commission estimated about double this figure for the actual number of sets operating. Official Customs returns showed 8,937 new sets imported into the Colony during 1955.

Services of the main Christian Churches, including the Fiji Methodist Church, are broadcast on Sunday evenings. Special time is set aside for the observance of Indian religious festivals, and when time is available, provision will be made for regular Indian religious broadcasts.

GILBERT AND ELLICE ISLANDS GROUP. Tarawa Wireless Station, which has a 500 w. transmitter operating on a frequency of 11 megacycles, broadcasts a 15-minute news summary in morse twice a week to the outer islands, and the news is then spread by word of mouth. Since October 1952 there has also been a 20-minute broadcast of news in the vernacular on Sunday afternoons prepared by the Information Office and the Co-operative Department. The Co-operative Department, which is situated near the Central Wireless Station at Betio, Tarawa, has used radio considerably to publicise news of the co-operative movement, and some of the broadcasting equipment has been purchased from funds controlled by the Co-operative Societies Officer. All broadcasting is now in the hands of the Information Office. It was proposed to set up a broadcasting service for the Ellice Islands in 1954.

There is also a small low-powered medium-wave transmitter (30 w., 844

Ivia Urevo reading the news in Police Motu over Station 9PA Port Moresby.

Boys of the Utu District Demonstration School, Kavieng, New Ireland, listening to a special educational programme on their school receiving set.

kc/s, call sign VTW) at Tarawa, which is used for broadcasting programmes for the expatriate listener. The transmitter was built locally from available parts, with some additional equipment supplied by the Co-operative Societies Officer. The work was done by members of the Wireless Department in their spare time, and the first transmission was made in October, 1954. The equipment was at first located in the home of one of the Wireless Officers, but a small building was later erected from salvaged materials.

Programmes consist of gramophone records (usually borrowed), UNESCO features and any other available material. Broadcasts are made each Friday evening for an hour or more, depending on the availability of programme material and staff. Few islanders have radio receivers; the list of holders of wireless receiving licences is almost exclusively made up of Europeans. The licence costs 5/- p.a.

GUAM. One broadcasting station, owned and run by a private corporation, is in operation on Guam. A 1000 w. transmitter operates on a frequency of 610 kc/s. Transmission is continuous from approximately 0600 hours to 2400 hours local time. Programming consists of advertiser-sponsored material with daily programmes in the local and Filipino languages. A considerable number of community service programmes is broadcast.

A television station is now under construction. Programming is expected to consist of filmed programmes from advertisers and some "live" programmes originating on the island.

NETHERLANDS NEW GUINEA. The Public Relations and Broadcasting Service of the Government operates a broadcasting station at Biak. The 5 kw. transmitter operates on a frequency of 5045 kc/s at night and on 7190 kc/s in daylight and replaces a low-powered station at Hollandia. The station transmits for about 40 hours per week. There is a 30-minute programme in Malay daily for the indigenous population, including a news bulletin lasting 10 minutes. (In the composition of the Dutch programmes co-operation is received from "Radio Nederland Wereldomroep" at Hilversum in the Netherlands.)

No information is available regarding the number of radio receivers, because no licence fee is charged. In the interior almost all heads of local government and police commandants as well as various Administration assistants have a receiving set on loan from the Department of Internal Affairs. These sets are also used for community listening.

NEW CALEDONIA AND TAHITI. "The Voice of France in the Pacific (*La Voix de la France dans Le Pacifique*), operating through Government-controlled stations, broadcasts daily from both Nouméa in New Caledonia and Papeete in Tahiti. From Nouméa the daily transmissions from Monday to Saturday are from 6 a.m. to 7 a.m. and from 11 a.m. to 1 p.m. simultaneously on 3355 kc/s (500 w) and 6035 kc/s (1 kw.), and from 6 p.m. to 9.30 p.m. on the same frequencies but with 6 kw. output for the 6035 kc/s transmission. On Sundays the transmission hours are from 8 a.m. to 1 p.m. and from 6.30 p.m. to 9.30 p.m. From Papeete the daily broadcasts from the 4 kw. transmitter are on 6135 kc/s.

Nouméa presents a well-balanced programme of music and other entertainment, news and information, with some advertising. Occasional broadcasts have been specifically directed towards neighbouring island groups. At present the broadcasts are in French but it is hoped that within the near future a regular weekly English programme, probably of thirty minutes' duration, will be instituted with a view to interesting listeners in Australia, New Zealand, and the Pacific generally.

Papeete has programmes in Tahitian and English as well as in French.

NIUE ISLANDS. Loudspeakers outside Niue wireless station broadcast the Pacific sessions of Radio New Zealand.

PAPUA AND NEW GUINEA. The territory is served by two stations controlled by the Australian Broadcasting Commission 9PA (500 w. on a frequency of 1250 kc/s) and VLT6 (200 w. on a frequency of 6130 kc/s). Both stations broadcast the same programme simultaneously and are the only stations in the territory.

The programmes provided for Europeans are similar to those broadcast on the Australian Broadcasting Commission network in Australia. Recent additions include a special schedule of broadcasts to schools, a women's session on four days a week and the full children's session as provided on the mainland.

The hours of transmission have also been extended, and the full schedule is as follows:

Monday to Friday inclusive—	
	6.45- 2.45 p.m.
	4.00-10.45 p.m.
Saturday	6.45- 9.30 a.m.
	12 noon-11.00 p.m.
Sunday	7.45- 2.00 p.m.
	4.00-10.00 p.m.

For the indigenous population a special service is provided for a duration of 85 minutes, Mondays to Fridays. This service is prepared and presented by the Administration, and its main aim is to interpret to the people Administration activities and the world around them. Additional material of a broadly educational character is added to cover such subjects as health, native agriculture, native affairs (Councils, co-operatives, etc.), and infant welfare. Programmes

THE WORLD'S
LARGEST — FASTEST — FINEST
are lubricated by the makers of

Mobiloil

The World's Quality Oil

Throughout the world today, more cars, motorcycles, trucks and tractors are protected with Mobiloil than with any other oil. It is truly the world's quality oil—designed to give your engine complete protection.

WHY ACCEPT ANYTHING LESS?

VACUUM
QUALITY PRODUCTS

M29

VACUUM OIL COMPANY PTY. LTD. (Inc. in Aust.)

on one day each week are directed especially to the women of the territory. There are no specifically native school broadcasts as yet.

The daily programme includes:

(a) Three 8-minute news services (English, Police Motu and Pidgin);

(b) repeat broadcasts of the more important news items in various vernaculars;

(c) a daily 6-minute feature programme in Police Motu and English;

(d) indigenous music, part of which is recorded in the field and part provided by live artists in the studio.

The languages used are English (70 minutes weekly including a special 25-minute programme on Mondays); Police Motu (the Papuan *lingua franca*); Pidgin and up to eight vernaculars, viz., Pure Motu, Orokaiwa, Roro, Suau, Toaripi, Dobu, Yabim, Kuanua. Additional vernaculars are added as required for specific occasions. Nearly all the vernaculars selected are those that have been extended by Mission influence to become "area" languages. They supplement the regional *lingua franca* where this is necessitated by the fact that female listeners do not readily understand the *lingua franca*.

The preparation, translation, and presentation of the programme is in the hands of the staff of two Europeans and eight indigenous "translator-announcers". This staff is also responsible for all field recordings. Constant patrols are made throughout the territory and a considerable library of both acetate and permanent recordings has been built up. The Administration has permitted the Commission to include in the clearing-house service for broadcast recordings a large number of these discs.

Reception facilities are now growing and audience reaction is enthusiastic. In most areas, village people have not yet reached an economic level where individual or even community purchase of receivers is possible, but in the main centres the number of native-owned receivers is growing.

The Administration has distributed eighty heavy-duty receivers and 500 small receivers to hospitals, messes, compounds, etc., wherever a potential audience of more than forty can be guaranteed. In addition to this, nearly all co-operative centres and Local Government Councils provide sets which form the nucleus of very active community listening. Many business firms such as the Australasian Petroleum Company, employing a staff of three thousand, are radio equipped and offer their staff every facility to listen.

TOKELAU ISLANDS. The Government has installed receiving sets in villages and schools, and programmes from 2AP in Western Samoa are received.

TRUST TERRITORY OF THE PACIFIC ISLANDS. The Trust Territory of the Pacific Islands under United States administration operates a broadcasting station at Majuro in the Marshall Islands. The transmitter has has an input rating of 300 w. and operates on 1500 kc/s for a period of three hours daily, except Sunday. The station is operated by the District Department of Education with supervision provided by the Director and the District Communications Officer.

Programming is divided into periods of musical entertainment, educational programmes, island news and talks by medical, sanitation and agriculture department heads. All programming is directed to the indigenous population. Operation, including announcing and supervision, is by indigenous employees of the government. Approximately 55 radio receivers have been sold to islanders during the past two years. The Department of Education plans to purchase additional receiving equipment for their schools on the outer islands. No licence fee is charged.

Another broadcasting station is operated by the Armed Forces Radio and Television Service on Kwajalein, but all programming is directed to members of the armed services on that atoll and nearby military installations. A power of 1000 w. on 1440 kc/s is used.

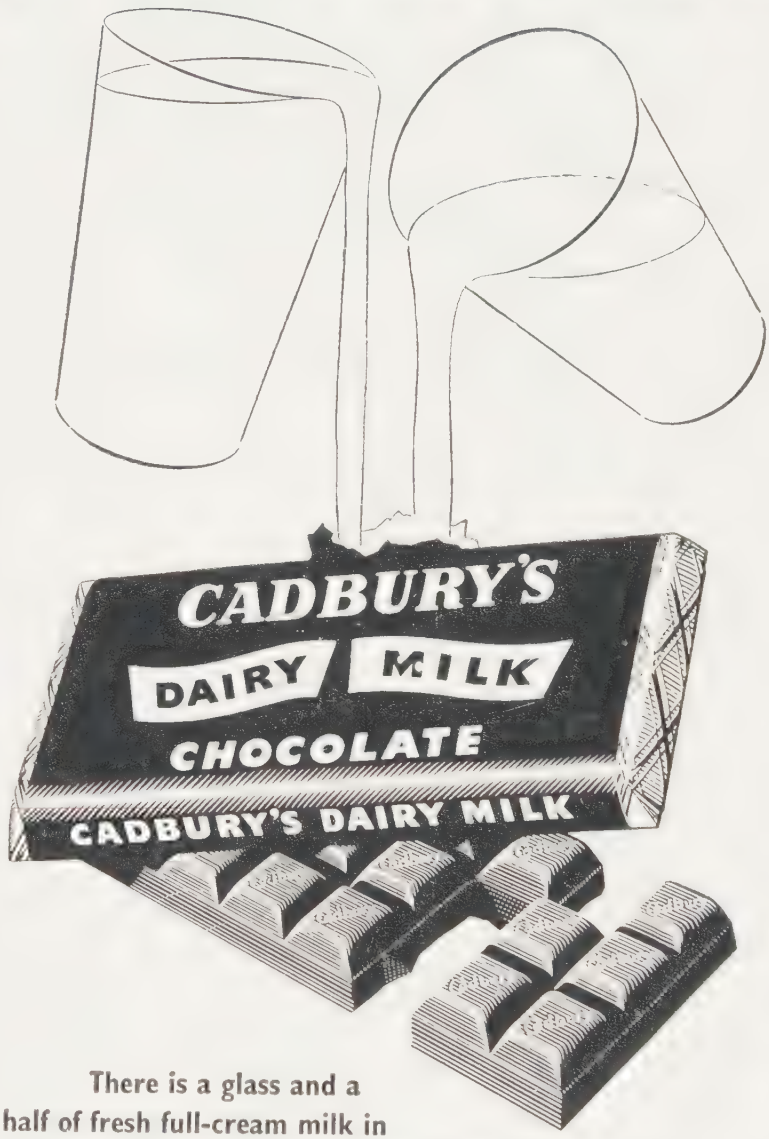
WESTERN SAMOA. 2AP, Apia, which was opened in 1948, operates on a frequency of 1420 kc/s. Programmes are sent from the studio by landline to the main transmitter, which is situated on a hill above Apia. Transmissions are made on Monday to Friday from 7 a.m. to 9.30 a.m. (school broadcasts 8.30-9.30 a.m.), and Monday, Wednesday, Friday and Saturday from 6.30-10.00 p.m., and Sunday from 6.30 p.m.-9.00 p.m. in the English and Samoan languages.

The technical standard of the transmissions has been considerably improved in recent years and is now comparable with that of well-established overseas services. Programmes include regular foreign and local news bulletins, documentary programmes, interviews, talks (especially on local activities such as health, co-operatives and agriculture), church services, proceedings of the Legislative Assembly, and entertainment (consisting of "live" broadcasts, tape recordings, many of which are made on visits to outlying villages, gramophone records, and transcriptions). In 1955 a total of 126 talks and interviews were broadcast. Most of the entertainment in the Samoan sessions is provided by Samoan artists, an interesting development being the introduction of plays written by Samoans, and especially adapted for broadcasting, as well as translations of United Nations programmes.

The schools broadcasts are prepared by the Education Department, and relayed from a special studio within the

(Continued on page 56)

The sign of good chocolate



There is a glass and a half of fresh full-cream milk in every half-pound of Cadbury's Dairy Milk Chocolate. Over the years, this famous Cadbury identification has symbolised the world's finest chocolate.

CADBURY'S

BY MOUNTAIN AND SEA, CLAREMONT, TASMANIA

MD102/43/8

The BNZ offers you a complete commercial and personal banking service

Export and Import Facilities
Currency Exchange
Financial Transactions
Trade Information and Introductions
Collections and Payments
Travellers' Cheques
Letters of Credit
Safe Custody
General Advisory Service
Travel Arrangements, Bookings, etc.

If you have business with, or are travelling in the Islands, the comprehensive facilities and wide experience of the BNZ are at your service.

Bank of New Zealand

Established in the Pacific Islands since 1876

Branches at SUVA, LAUTOKA, LABASA, NADI and BA (Fiji), and APIA (Samoa).
Agencies in Fiji at MARKS ST., SUVA, LAUCALA BAY AIRPORT and NAUSORI.

Mechanization Of Timber Extraction

(Continued from page 40)

the logging arch or the flat-bed semi-trailer. Both are drawn, in most cases by a Caterpillar D7 tractor (70 to 90 h.p.) or a Latil wheel tractor (65 h.p.). On hilly terrain the arch is replaced by the flat-bed semi-trailer or the low Caterpillar trailer which can be used on up to 20% gradients. Where the gradient is too steep the winch is used alone.

The logs ready for loading are lined up along the track or on inclined loading areas. This arrangement makes it possible to bring the transport lorries in closer to the logs.

LOADING: The aim here is to complete loading of the lorry and trailer in the shortest possible time, for reducing loading time means increasing the number of trips, thus cutting down production costs. The same applies to removal by rail.

One of the most modern methods of loading is with the log hoist. The logs are raised up the side of the timber train (lorry and trailer specially equipped for carrying logs) by means of a cable run off the motor of the lorry. By this methods 10 to 14 tons can easily be loaded in 15 to 20 minutes.

The classical method of loading with a winch and inclined plane is much less commonly used than the above, because the log becomes unbalanced if not raised by the exact centre.

Loading with a derrick, although far from modern (three planks and a winch) is still frequently used because it is simple, cheap and holds the load ready in advance. Mechanization of this system has eliminated its drawbacks, i.e., labour requirements too high, the need for moving the logs with additional equipment, and the low raising power (maximum 10 tons). The modern mechanized derrick is a kind of crane with stabilizing props, fitted on a lorry which not only works and transports it, but is also capable of hauling up the logs to be loaded with the help of a shovel winch.

Loading can also be done with a timber arch with elongated swan-neck or with derricks which are easily transported, and can be automatically raised or lowered.

TRANSPORT: This can be effected by making use of downstream currents, by towing on level waterways (lagoons), by rail in open trucks, or by road in lorries and trailers.

Unloading, like loading, influences the speed of transport by road (which together with the toughness and durability of rolling stock, is one of the secrets of keeping production costs as low as possible).

ROADS: A logging site is not normally situated close to an existing main highway or a navigable watercourse. It is, therefore, necessary to build a main road (the spinal column, as it were, of the undertaking) along the most suitable

route, taking great care in construction.

If the undertaking comprises several different working areas, secondary roads have to be made connecting them with the main stream of traffic.

These secondary roads, which require less care in construction than the main one, will lead off into rough tracks designed to give access to the workable stands. Here a number of paths are quickly cut so as to allow the logs to be transported by tractor from the felling site to the clearing grounds situated within the stands.

When the land is too hilly and the climate too humid, this system of roads is sometimes replaced by a narrow-gauge railway system. Both, however, require levelling work, which, depending on the size of the undertaking, is done by a combination of manpower and mechanized equipment.

The levelling equipment used is the angledozer, scraper and rooter, harnessed to Caterpillar tractors of the D7 (occasionally D8) type. To displace a stretch of from 150 to 240 feet the bulldozer or angledozer, drawn by a tractor, is sufficient, without any supplementary equipment. For removing between 240 and 1,500 feet the scraper is more economical.

The Caterpillar tractor with bulldozer (or angledozer) and scraper is considered the normal basic equipment for levelling. Sometimes a rooter is included; this is a sort of three-pronged trenching plough used for breaking up lateritic or solid clay deposits.

The average output for this type of work can be reckoned at 2 cubic yards per man per day when the work is not mechanized, and at least 460 cubic yards per day when it is.

The degree of mechanization possible here varies according to the extent of the undertaking and the relief of the terrain. However, the bulldozer alone has so many advantages over manual levelling that it can be considered an indispensable piece of equipment for all types of logging work.

It is obvious that any form of mechanization involves maintenance of equipment, which is generally a fundamental factor in evaluating the economic nature of the undertaking. However, it is not possible within the limits imposed by this general presentation of information to examine this particular aspect in detail.

In timber extraction, more than in any other field, mechanization plays a vital part; the logger must be prepared, both financially and technically, to utilize modern methods of extraction if he wishes to make the best possible use of tropical woods.

For all banking services . . .

First and largest trading bank in the South-West Pacific, the Bank of New South Wales provides banking services at over 900 points throughout Australia, New Zealand, Fiji, Papua and New Guinea.

Residents and visitors are invited to avail themselves of the "Wales" complete banking service at the following centres:—

FIJI

Branches: Suva, Lautoka, Nadi, and Ba.
Agencies: Nadi Airport, Vatukoula, Sigatoka, Raki Raki, and Tavua.

PAPUA

Branches: Port Moresby and Samarai.
Agency: Boroko.

NEW GUINEA

Branches: Bulolo, Lae, Madang, Rabaul, and Goroka.
Agencies: Kokopo and Wau.

You can bank on the "Wales"

Consult and use—

BANK OF NEW SOUTH WALES

FIRST AND LARGEST TRADING BANK OPERATING IN AUSTRALIA NEW ZEALAND, FIJI, PAPUA AND NEW GUINEA

(INCORPORATED IN NEW SOUTH WALES WITH LIMITED LIABILITY)

A5536a

Don't wait...

have it sent

air cargo

Qantas operates 5 SERVICES WEEKLY FROM NEW GUINEA TO AUSTRALIA. So, when ordering merchandise from Australia, (or from other countries), or when sending merchandise anywhere in the world, arrange to have it forwarded by Qantas Air Cargo for quick, safe delivery. Qantas is experienced in handling all types of commodities from extremely bulky to small and fragile items.

QANTAS

AUSTRALIA'S OVERSEAS AIRLINE

QANTAS EMPIRE AIRWAYS LTD.
IN ASSOCIATION WITH B.O.A.C. AND TEAL

PA20 91 4

From Subsistence To Cash Crops

(Continued from page 15)

in Fiji, but seems to have no prospects elsewhere, owing to the high capital costs involved in building a sugar mill, and to the adequate supplies of sugar already available on the world market. Rubber is important in Papua, but has not as yet been successful in other areas where it has been tried, such as Fiji and Samoa. Tea is being seriously tried on an experimental scale as a cash crop in New Guinea.

Considering the area as a whole, three export crops stand out as being of major importance at present, and in the immediate future. They are coconut, cocoa and coffee in that order of importance. The improvement of their yields in quantity, and still more in quality, is the main task of agricultural work in most territories.

Among other crops now being tested, the most important is probably black pepper, which requires careful attention, but offers high returns on limited areas. Various fibre plants have been tried; much work has gone into efforts to establish kenaf in Papua, a project which is not without difficulties. Annual oil plants, such as sunflower and castor oil, might be useful either for export or for local use. Peanuts can be considered an oil crop, but at first are more likely to be used or exported as the whole seeds. They are already grown on a moderate scale in some localities in New Guinea and other territories.

Rice production is also increasing in New Guinea, and seems likely, with the active encouragement of the Administrations of both the Australian and Dutch parts of the island, to become more important in the near future. Considerable expansion would be needed to cover the amounts of rice now imported. Fiji is the only Pacific territory which at present produces more than a small part of its requirements of rice.

Fruits and vegetables for local sale are already cash crops of some importance in districts with adequate transport facilities to centres such as Nouméa, Papeete, Rabaul or Suva. The local market is everywhere capable of expansion, and in some territories both grower and consumer would benefit by the provision of even elementary marketing facilities.

Progress Has Brought Problems

The islanders have clearly made progress in growing and handling cash crops, but naturally everything is not perfect. Native cultivation practices and processing methods are often most inadequate. Competition between cash crops and subsistence gardening has often ended in the people buying food of less nutritive value than that which they formerly grew for themselves. Several cash crops are already ecologically and economically adapted to conditions in the Islands, but greater diversification is needed. In some territories there is a real need for cash crops which can give a quick return while perennial plants are coming into bearing, or if their crops fail or become unprofitable.

Economic development poses some special problems when dealing with people who are familiar with only a strict subsistence economy, as in some of the high islands of Melanesia. These people have usually an excellent understanding of their own environment, to which their gardening techniques are perfectly adapted.

In introducing cash crops it is essential to maintain this balance between man and land. The European officer dealing with agricultural extension in native villages needs first a good knowledge of the people's farming system before he can adapt it to the production of cash crops. It cannot be assumed that plantation methods are applicable on a village scale. Throughout the islands there are ghastly examples of land ruined in a few years by European or Asiatic farming methods, in conditions where the local people had evolved a stable agriculture.

Need For Further Developmental Work

The campaigns to extend and intensify the production of cash crops are necessary and important; they are also beset with serious difficulties and dangers. Their success demands further work in research, experiment and plant introduction, in exchange of information between territories, and in agricultural education at the village level. In all these fields the South Pacific Commission has an important part to play.

Second International Coconut Conference

(Continued from page 39)

Minister of Food and Agriculture. The session will last three days, during which the delegates will visit a desiccated coconut mill, an oil factory, a coconut estate and the headquarters of the Government Oils and Fats Corporation at Seeduwa.

The plenary sessions will be held on February 28 in Colombo, and will be opened by Mr. R. G. Senanayake, Minister of Trade and Commerce.

The Conference will be under the patronage of Mr. S. W. R. D. Bandaranaike, Prime Minister of Ceylon. Mr. C. H. Z. Fernando, Chairman of the Ceylon Coconut Board, will preside at the meetings.

Among the questions to be discussed at the Conference are the standardizing of the quality of copra and other coconut products, and the milling and processing situation in the principal importing countries.

PACIFIC READING

Material in this section is contributed by the South Pacific Commission Literature Bureau. Any enquiries relating thereto should be directed to Box 5254, G.P.O., Sydney, Australia.

Notes and News

Library Bindings For Paper-Bound Books. The rapid deterioration of paper-bound books is often found to be a problem in the islands. This is perhaps particularly so in libraries. For *Penguin, Pelican, Pan,* and other paper-bound books of similar size, i.e. 4-7/8 inches x 7-1/8 inches, it is now possible to buy simple binding outfits which can be used without previous experience of binding.

These outfits, known as "Bind-Your-Own Book Covers", are produced by Bind-Your-Own, Ltd., 22 Charing Cross Road, London, W.C.2, for stg.7s.6d. a set. Sufficient material is supplied in each set to cover six books; the outfits including cloth cover-boards, spine cloths, and papers, glue, and paper for gold-lettering.

For one book, the whole operation of removing the original cover papers and placing on the new boards and end papers, can be performed in about ten minutes. The gold lettering for the spine is simple to apply: it is merely a matter of writing with a ball-point pen, or pencil, on one side of the gold leaf which is supplied, and a direct transfer of the lettering is thus made to the spine of the book. The lettering is not, however, as clear as could be wished, and better results may be obtained by cutting the lettering from the original paper spine and pasting this to the cloth spine. This appears to be the only drawback to these covers, which should increase the life of books a great deal. Many island libraries will, no doubt, find these outfits extremely valuable.

Hygiene Book. Publication is expected shortly of *A First Hygiene Book*. The manuscript of this book was received from the New Hebrides. It has been simply written in English by Sheila Jamieson, while the numerous clear black-and-white illustrations are by Joy Fox. We believe that this book will be welcomed by many people in the islands who have, for a very long time, required an extremely simple and well-illustrated hygiene book.

It is apparent that the widely differing conditions and needs of the Pacific territories make it virtually impossible to meet all their requirements by the production of one book. The Literature Bureau has, from its inception, studied closely this problem of meeting varying needs in the most economical manner possible and has done a good deal of experimental work in this connexion.

A First Hygiene Book has been designed primarily for Melanesian territories; even there, conditions differ so widely that a single edition could not meet all requirements. It was therefore decided to produce it on separate sheets of paper bound with coiled wire. By doing this, it has been possible to omit certain sheets, and amend it by adding new ones designed to meet particular requirements; and in this manner three separate editions have been produced at a very much lower total cost than would have been possible by conventional publication methods.

The three editions have been planned to meet the requirements of the New Hebrides, Papua and New Guinea, and the Trust Territory of the Pacific Islands.

Enquiries about this book should be addressed to the South Pacific Commission Literature Bureau, Box 5254, G.P.O., Sydney, New South Wales. Copies will be on sale from the Literature Bureau at A.3s. each.

Bookselling. Messrs. Beadel's Bookshop, Ela Beach, Port Moresby, are now stocking copies of books produced through the Literature Bureau in association with various publishers. Judging from the number of requests the Bureau has received from Papua and New Guinea in the past for assistance in obtaining books by purchase, it is evident that a considerable difficulty has been met in buying books locally. It is believed, therefore, that the facilities now being offered by Beadel's Bookshop will be welcomed not only by the indigenous population, but also by educationists in the territory.

Staff. The Commission's Visual Aids Officer, Mrs. N. Phelan, retired from Commission service at the end of May. Pending the appointment of a new officer to this position, the Visual Aids services provided to territories will be continued by the Commission's social development section.

Literature Bureau Publications. *Papua and New Guinea in Pictures,* an elementary social studies book by E. P. W. Marriott, is being published in the near future by Messrs. Macmillan & Co., in association with the South Pacific Commission Literature Bureau. It deals with numerous aspects of life in the territory and is illustrated with photographs. Each left-hand page carries a full-page illustration and the accompanying text appears on the right-hand page. It should prove of interest not only for schools in the territory, but also to all those who are eager to learn something of the way of life in Papua and New Guinea.

Another publication expected shortly is *Heroes From Fiji,* by R. S. Adam. It also is being published by Macmillan & Co., in association with the Literature Bureau. It deals with deeds of bravery performed in war and peace by Fijians and Indians and Europeans from Fiji. It is illustrated by excellent photographs and the text is in extremely simple English. This will be the first title in the new Pacific Heritage Series which will be devoted to biographical material of Pacific interest.

We shall welcome receiving manuscripts and suggestions for possible inclusion in this series of small inexpensively-produced books.

Health Leaflet. The Literature Bureau has produced, on behalf of the Health Department of Western Samoa, an illustrated leaflet in Samoan on the subject *Elephantiasis Is Preventable.* The text was prepared by the Commission's health section working in close co-operation with the Director of Health, Western Samoa. The leaflet describes the cause of filariasis and the measures which should be taken to rid villages of mosquitoes.

Free specimen copies are obtainable from the South Pacific Commission Literature Bureau, Box 5254, G.P.O., Sydney, New South Wales.

South Pacific Literature Bureau

The following books, which have been published by various publishers in association with the Literature Bureau, are available from booksellers.

Heroes From Fiji. R. S. Adam, published by Macmillan & Co. stg.2s.2d.

Rice. W. Cottrell Dormer, published by Longmans, Green & Co. stg.2s.6d.

Plays For Young People. Camilla Wedgwood, published by Longmans, Green & Co. A.2s.6d.

(Continued on page 53)

BOOK LIST No. 15

Items reviewed have been chosen for their general interest or for their relevance to educational and development problems in the South Pacific area. Wherever possible the price stated is the published price in the country of origin.

AGRICULTURE

DRAINING THE SOIL and IRRIGATING THE SOIL. Gwen Cross. London: Longmans, Green; stg.1s.4d. each. 1956. pp. 40 each. Illust. (*Tropical Library—Farming Series*)

These books are the most recent additions to the series (earlier titles were reviewed in *Pacific Reading* No. 6).

Draining the Soil deals with a subject which it is not altogether easy to explain in simple terms, and, although it has been made as simple as is practicable, it may not prove as easy to follow as some of the earlier titles. It begins by describing the various soil formations and their respective water levels and goes on to deal with natural draining, the draining of top soil and sub-soil; it describes the manner of making draining ditches and various methods employed in different countries in draining the sub-soil.

Irrigating the Soil is somewhat simpler in the treatment of its subject, and it explains the various systems of irrigation which have been used in all parts of the world from the earliest days to modern times, the reasons they have been employed, and their results.

This is an excellent series, and these two additions will be welcomed everywhere as providing simple treatment of complex and urgent problems.

GENERAL READING

WRITERS OF TODAY. D. Waldo Clarke. London: Longmans, Green; stg.3s.6d. 1956. pp.92. Illust. (*Essential English Library*)

The *Essential English Library* is intended mainly for overseas students whose mother tongue is not English; some of these titles are fiction and some non-fiction. *Writers of Today* is a recent addition to the series and, like other titles, it has been written for the well-educated and sophisticated overseas reader. It describes the life and works of James Joyce, T. S. Eliot, Virginia Woolf, Aldous Huxley, Charles Morgan, Graham Greene, and some of the poets and dramatists of the present time.

BONUS DAY. E. S. Kapotwe. London. Longmans, Green; stg.1s.2d. 1954. pp.24. Illust. (*Pathfinder Books*).

This interesting little book by an African author describes the everyday life of a Co-operatives Officer. The simple, direct, and unaffected style makes delightful reading, and it should prove of interest to the general reader as well as to those who are already connected with the work of co-operatives. The book does not attempt to teach anything and is merely a description of a few typical days in the author's working life. The setting of the story is Nyasaland, but this will not detract from its potential interest to island readers and applicability to Pacific conditions, as human nature is much the same the world over.

Perhaps this altogether admirable piece of writing will, in addition to being read and enjoyed, act as an incentive for potential island authors to produce manuscripts.

LOUIS PASTEUR. Evelyn Attwood. London: Longmans, Green; stg.3s. 1954. pp.154. Illust. (*Lives of Achievement Series*)

This excellent biography of Louis Pasteur, which has been written within a controlled vocabulary of 2,000 words, has been designed for overseas students of English. The author has drawn much of her information from the admirable *Life of Louis Pasteur,* written by his son-in-law, René Vallery-Radot.

The book describes Pasteur's emotional conflict throughout life between the ties of family, which he so keenly felt, and his scientific research work. A picture emerges of not only a great scientist, but also a great philanthropist.

The story describes his early life; his first successful experimental work on tartaric acid crystals; his discoveries regarding infected yeast and their importance in the development of good wines, and beers; his valuable contribution to the salvation of the disease-threatened silkworm industry of France; Lister's employment of carbolic acid in the sterilization of wounds and surgical instruments is revealed as being a direct outcome of Pasteur's research. The important work which the latter did and which enabled anthrax, scabies and hydrophobia to be overcome is also described.

The author has handled her subject extremely well and has produced something which makes enjoyable and instructive reading for people of all ages. Her book could, perhaps especially for the young, act as an incentive to learn and achieve.

Other titles in the series are *Madame Curie* by Eve Curie, *Captain Scott—Explorer and Scientist* by M. E. Carter, *The Story of My Life* by Helen Keller (reviewed in *Pacific Reading* No. 5), *Up From Slavery* by Booker T. Washington, *Thomas Edison* by Francis Trevelyan Miller, *Marco Polo* by A. Johnson. Each is written within a vocabulary of 2,000 words and includes a glossary giving any words outside this range.

PLEASURE AND PURPOSE. L. A. G. Strong and others. London: Longmans, Green; stg.6s. 1955. pp.viii + 247.

This is an anthology of prose specially selected for overseas secondary school pupils whose mother tongue is not English. The extracts are self-contained, and, apart from a few technical words, nearly all within a 5,000-word vocabulary. The selection has been graded in order of difficulty, and notes at the end of the book explain difficult words, idiomatic phrases, and allusions which might not be readily understood by overseas pupils.

"Reading for Pleasure" by L. A. G. Strong is probably a very wise choice for the first extract in this book. He concludes his essay with a summary, saying: "The only reason I ever read a book—in my spare time, that is to say—is because I expect pleasure from it. If I like it I go on. If it bores me, I stop. No one can bully me into liking what I do not like, and I should never, never try to bully anyone else into liking what he did not like."

One cannot help feeling that these altogether praiseworthy sentiments are a reflection of the compilers' feelings, too. They have made an excellent attempt to provide a variety of material in which everyone will probably find something of interest.

The selection includes fairy tales by Oscar Wilde, biographical material on Shakespeare and Dickens by G. Holroyd, and on Andrew Carnegie and Madame Curie by E. H. Carter, scientific articles by Horace Shipp, James Jeans, G. C. Thornley, and L. P. Jacks, and short stories by authors such as O. Henry, Stephen Leacock, and Pearl S. Buck.

A MIRROR OF THE TIMES. Books 1 and 2. Andrew Scotland. London: Oldhams Press; stg.6s. 1956. pp.223 and 224.

These prose anthologies have been designed for English secondary schools. Recognizing that children are more likely

to be interested in current affairs than those of bygone days, the compiler has chosen many of his extracts from recent occurrences.

Examples of this in Book 1 are "The Kon-Tiki Expedition" by Thor Heyderdahl, "The Conquest of Everest" told by Sir Edmund Hilary from Sir John Hunt's book *The Ascent of Everest,* "Encounter with Sharks" from Hans Haas' book *Diving to Adventure,* "The Discovery of Penicillin" by J. D. Ratcliff, "Into the Sea" from *Jet* by Sir Frank Whittle, "Through the Tunnel to Freedom" from *The Wooden Horse* by Eric Williams.

Book 2 includes exciting wartime stories, examples of which are "Landing by Parachute" from *Duel of Wits* by Peter Churchill, "Breaching of the Moehne Dam" from the *Dam Busters* by Paul Brickhill. Other extracts include work from authors such as Neville Cardus, T. E. Lawrence, Hammond Innes, Rudyard Kipling, and Sir Winston Churchill.

Although many of the extracts probably will not be regarded as literature (in the more restricted meaning of the word), they will probably be welcomed and provide encouragement to students to read more of the works of these authors. Even those most critical of the plain classical fare so often served in anthologies designed for schools will not be able to describe these books as being stodgy, and they will undoubtedly find a place in many secondary schools and libraries in the islands.

READERS

THE FIJIAN READERS. Books 1-3. Staff, Fiji Education Department. Melbourne: Oxford University Press; stg.2s.3d.; 2s.3d.; 2s.9d. 1956. pp.24, 32, 59. Illust.

Though these readers are in the Fijian language, education departments in other Pacific territories may well wish to know of their existence and to examine copies, for they are very well produced with attractive pictorial covers and, in the case of Books 2 and 3, excellent half-tone photographs of life in Fiji.

In his preface Mr. Adam, Principal of the Research Institute in Fiji, points out that the books are deliberately not linked to a particular class; teachers are to progress from one book to the next when full value has been extracted from each. Some classes will work through them more quickly than others.

GEOGRAPHY

GEOGRAPHIE d'OCEANIE. J. Tarraire. Paris: Fernand Nathan. Price unknown. 1955. pp.64. Illust.

Géographie d'Océanie is a geography text-book designed for use in schools in the French territories of the Pacific. It adopts a most interesting approach to the question of an atlas for Pacific schools by combining an atlas and text-book within a single volume.

The pages of the book are large—27 x 21.5 cms.; maps appear on more than half of them, some full page in size and many in colour; and in addition there is a large number of pictures, some being in colour, while others are half-tone photographs. The text is interspersed between the maps and other illustrations throughout the book.

Within the compass of 64 pages the text is naturally rather condensed and factual rather than narrative, but it provides a comprehensive summary of the general physical, economic, and political geography of the French territories in the Pacific (about one-third of the book), the mother country, and the remaining areas of overseas France. Reference to Pacific territories other than French ones is slight. A feature of the book is the truly remarkable quality of the half-tone illustrations, printed as they are on a rough-surfaced paper.

It is understood that copies are available only from Importex, Papeete, Tahiti.

SOCIAL STUDIES

AUSTRALIA FOR SECOND CLASS. W. Hill, Sydney: School Projects Pty. Ltd.; A.3s.3d. 1955. pp.32. Illust.

In her foreword to this book the author states: "It will be essential at first for the child to learn to know and love his own community, town and country before he can realize and appreciate the living conditions of others." In the very earliest stages of social work the use of text-books and the practice of note-taking will no doubt be out of place, and little stories from the teacher and quite informal class work will suffice. But between this and later, and more formal and systematic work comes an intermediate stage when the child's reading and writing abilities are developing but not yet fluent. At this stage three processes are at work; the child is being introduced to new facts; he is developing his mechanical skills in reading and writing; and he is also being introduced to the new ways of study and recording his knowledge which these skills make possible. Thus at this stage the 'work book' can be very helpful in meeting the requirements of these processes.

Australia for Second Class is a good example of a very simple work book. It contains short passages for reading; numerous outline drawings and other pictures of the things read about; instructions for simple things to do, like colouring the flowers illustrated, drawing a boomerang, pasting in a picture of an animal found locally, and so on; and it contains a large number of simple questions to be answered in one or two words.

The layout of the book is so arranged that these things

HARRAP

The Play-Learn Reading Scheme. By W. Murray and L. W. Downes. A new reading scheme suitable for children who are beginning to learn to read English. It consists of six Pre-readers, a Reading-games book and a Teacher's book—Children Learn To Read. Prices and full information available on application.

The Blake Family. By G. H. Holroyd, M.A. Four little illustrated readers about the day-to-day life of two real English children. Each book contains 24 pages of which 8 are full-page photographs depicting incidents in the story. At Home. At The Circus. At Christmas. Goes Shopping. 1*s.*6*d.*

The Staircase to Truth. By Canon Aidan Hervey. In a book that is first and foremost a story, Canon Hervey provides a guide to the Old Testament for young people. It will also provide a central theme and background material for stories to be told to younger children. 6*s.*

GEORGE G. HARRAP & CO. LTD.
182 High Holborn, London, W.C.1.

THE TROPICAL LIBRARY

FARMING SERIES

by

GWEN CROSS

Two new illustrated booklets are now added to this series which deals with farmers and their problems. These booklets are of great value to Rural Training Colleges and schools in tropical countries where emphasis is placed on practical outdoor activities.

☆

BOOK 7:

Draining The Soil

☆

BOOK 8:

Irrigating The Soil

Each 1s. 4d.

☆

Two more booklets in this series are in preparation:

SOIL EROSION

AND

SOIL CONSERVATION

LONGMANS, GREEN & Co. Pty. Ltd.

6 & 7 CLIFFORD STREET, LONDON, W.1

can be done in the book itself—an excellent idea since it obviates the need for a separate exercise book (thus saving money), and also ensures that when the child has completed the book he has a complete record of the work done—in fact a little text-book which he has made himself.

The approach adopted in this book will thoroughly repay study, even if the reader's own community does not happen to be Australia.

TRANSPORT TRADE AND TRAVEL THROUGH THE AGES. R. W. Morris. London: Allan & Unwin; stg.3s.6d. pp.32. Illust. (*Understanding the Modern World*)

The numerous illustrations, diagrams and maps in this book are so clear that they serve to explain the theme almost without the necessity of reading the text. Each main era from the days of the Roman Empire to present time is dealt with separately. A description is given of the method of building roads; illustrations show the modes of transport; diagrams clearly indicate the speed of travel of the various forms of transport available in each period; and maps indicate the roads, railways and world trade routes.

Although the book describes conditions in the United Kingdom only, it should prove of interest everywhere as an excellent example of a well-illustrated and well-told story of important developments. The text is fairly simple, and the condensation of such a large subject into the scope of of so small a book has been cleverly executed.

An interesting example of the author's method of dealing with the subject is given on the final page of the book. We have so often heard the phrase "speed makes the world seem smaller" and here circles representing the world indicate the way in which it has 'shrunk' and are based on the time taken for a journey from New York to Hong Kong. The first circle representing the world in 1837 is 2½ inches in diameter and the last for 1948 is a mere 3/32 inch. Suitable for upper forms of primary schools and libraries.

DOMESTIC SCIENCE

HOW TO WASH AND IRON THINGS FOR YOUR FAMILY. D. Cartwright. Cape Town: Longmans, Green; stg. 2s.9d. 1955. Illust.

This book has been designed especially for people in newly-developing tropical areas. It is simply written, well illustrated with numerous line drawings, and deals extremely comprehensively with all aspects of laundering. It gives details of the equipment required for laundry work, and keeps in mind the limited means of the people for whom it is written.

The book describes ways to soften water; suitable basins to use for washing (and, for those who are unable to buy a basin, it describes how one may be made from clay or by using banana leaves); soap; clothes line; pegs, and how to make them; charcoal, flat, and pressure irons; ironing tables; iron holders and stands.

After this introductory matter the book goes on to describe all aspects of laundering and the chapter headings give a very good indication of the comprehensive content. They are: WASHING WHITE COTTONS, BOILING WHITE CLOTHES, GENERAL RULES FOR IRONING, IRONING HANDKERCHIEFS, IRONING AND FOLDING UNDERWEAR, IRONING DRESSES, STARCHING, IRONING TABLE LINEN, SOAP JELLY, WASHING AND IRONING COLOURED COTTONS, WASHING AND IRONING SILK AND RAYON, WASHING AND FINISHING OF WOOLLENS, SPECIAL CARE OF BABIES' CLOTHES, REMOVAL OF STAINS, THE WEEKLY WASH.

This book should prove extremely useful to domestic science teachers and pupils in the Pacific, as well as to all women with a reasonably good knowledge of English.

PHYSICAL TRAINING AND SPORT

HOW TO BOX. T. Miller. London: Longmans, Green; stg.1s.9d. 1954. pp.34. Illust.

Whatever your views may be on the subject of boxing, it will probably be difficult to deny that it is better for people to box according to official rules and regulations rather than practise free-for-all fisticuffs. This book has been written in simple English for Africans but its applicability is world-wide. It is an elementary introduction to the sport and covers all the initial theoretical aspects required by those who wish to learn boxing. These aspects include attack and defence, training and ringcraft, southpaw technique, the manner in which contests are organized, refereed and judged, and the rules and regulations of boxing.

PHYSICAL EDUCATION FOR AFRICAN PRIMARY SCHOOLS. Books 1 and 2. stg.9s. each. 1955. pp.207 and 251. Illust. C. E. Whitworth-Smith and G. K. Huntley. London: Nelsons.

These two books provide a comprehensive course of physical training over a six-year period. Recognizing the difficulty that many native teachers experience in giving physical training instruction, detailed and helpful advice is given on all aspects of the subject. And the information provided is sufficiently comprehensive to enable teachers without previous experience of the subject to give the lessons effectively.

Book 1 covers the first three years of physical education and, as in Book 2, a separate lesson is given for each school week. Book 2 covers the fourth to sixth years of the course. Each lesson, in addition to containing exercises, games, and activities similar but more advanced to those in Book 1) which call for exertion of all parts of the body, deals with activities (similar but more advanced to those in Book 1) with major games (e.g. football, cricket, netball, athletics) and also to improve agility, vaulting, and balancing.

These books, although designed primarily for African conditions, should prove extremely useful in the Pacific.

South Pacific Literature Bureau

(Continued from page 49)

WEALTH FROM THE COCONUT. W. V. D. Pieris, published by Ure Smith Pty. Ltd. stg.2s.6d. (available in the following language editions: English, French, Fijian, Pidgin, Maori (Rarotongan), Samoan, Tongan, Malayan).

FOOD AND THE WORK IT DOES. Lucy Hamilton, published by Macmillan & Co. A.3s.

THE HIRI. Camilla Wedgwood, published by Longmans, Green & Co. A.1s.6d.

ACROSS NEW GUINEA. Ivan Champion, published by Longmans, Green & Co. A.1s.6d.

THE MAGIC POT. Peter Livingston, published by J. B. Wolters & Co. stg.1s.3d.

NA DINAU SA DAU VAKAVUNA (a Fijian edition of "Debts Make Difficulties"). Eunice Carpenter, published by Sheldon Press. stg.8d.

NA I VOSAVOSA VAKAVITI E SO (Fijian idioms). Anare K. Raiwalui, published by Oxford University Press. A.4s.

A MOTHERCRAFT BOOK. N. Stead, published by Longmans, Green & Co. A.5s.

HEALTH LITERATURE

The following health reading materials are available from the South Pacific Literature Bureau, Box 5254, G.P.O., Sydney.

A FIRST HYGIENE BOOK. A.3s.0d. a copy.

LEAFLETS AND PAMPHLETS

Tina Protects Her Family. A.16s.8d. a hundred.
Clean Milk. A.16s.8d. a hundred.
Clean Water. A.29s.0d. a hundred.
Fruit Juice For Baby. A.29s.0d. a hundred.
The Pregnant Woman. A.20s.0d. a hundred.
Infant And Maternal Welfare Clinics. A.20s.0d. a hundred.

OXFORD BOOKS ON SCIENCE

SIMPLE SCIENCE IN SIMPLE ENGLISH

These simple, fully-illustrated books are designed so that both their subject matter and their language are within easy comprehension of young pupils.

SOME TROPICAL PLANTS AND THEIR USES by *F. R. Irvine* 2/2

This is a simple account of the distribution, growth, and preparation of the chief tropical crop plants.

THE CLOTHES WE WEAR by *E. McIntosh* 1/6

This book discusses various clothing fabrics, including nylon and terylene, and how they are made.

THE SOIL AND THE PLANTS by *S. Rivers-Smith and W. K. Spencer* 2/6

Here is a practical account of different kinds of soil, and plant life in all its stages.

THE LIFE OF THE HONEY-BEE 1/4

Adapted from *Tickner Edwardes*

This is the story of the honey-bee, its life, organization, activities, and usefulness to man.

ANTS AND THEIR WAYS by *H. McKay* 1/4

This book gives a simple but fascinating account of the ways of the true ants and the white ants.

THE CREATION AND THE WORLD AROUND US by *S. Rivers-Smith and W. K. Spencer* 2/6

This is a book for readers interested in the why and the wherefore of daily sights and sounds.

AIR, WIND, AND RAIN by *H. McKay* 1/2

By means of the simplest experiments this book aims at arousing interest in basic physical laws.

LOOKING-GLASSES AND CANDLES by *H. McKay* 1/4

This book also directs students in their search for knowledge about light and combustion.

NOISES. THE SUN AND THE MOON by *H. McKay* 1/4

This book stresses simple but scientific observation for getting to understand common happenings.

All these books are recommended as supplementary reading to The Oxford English Course for Papua and New Guinea Sixth Book, The Oxford English Course Reading Book Three, and The Oxford English Course Alternative Book Four.

OXFORD UNIVERSITY PRESS

Australian Branch

346 LITTLE COLLINS STREET, MELBOURNE

VISUAL AIDS

Films in the Commission library are marked with an asterisk before the title, and are available for viewing by any metropolitan or territorial government on application to the Executive Officer for Social Development, Box 5254, G.P.O., Sydney, N.S.W., Australia. Age classifications, where given, are intended as a guide rather than a recommendation.

Films

*LUSAKA CALLING. 16 mm. 20 min. Colour. Sound. Central African Film Unit. Price approx. £A.25.

In a very unobtrusive manner this film manages to give a good deal of information. Its commencing shots show a radio recording engineer arriving in a Northern Rhodesian village, where a dance, accompanied by singing, is being performed. A recording is then made of the dance and it is immediately played back to the performers, who appear suitably impressed. The radio engineer then shows the villagers how the "saucepan" radio (so-called because of its shape) works. He leaves his assistant behind for a few days with the villagers to explain further to them about the workings of radio. The village headman is thus encouraged to buy a "saucepan" radio, and when the engineer returns to collect his assistant the headman accompanies them to Lusaka (the capital of Northern Rhodesia). In Lusaka he sees the broadcasting house and the manner in which broadcasts are made, and discusses the exact date and time when the recording made in his village will be broadcast. The final scene shows the assembled villagers listening to the broadcast of their own dance music.

This is a very well-produced film, and the colour is exceptionally good.

*MAKOGAI. 16 mm. 5 min. Black and white. Sound. Cinesound Productions. Price unknown.

This film is about the leper colony in the Fiji Islands. Each year, on only one day, visitors are allowed to the island. The film opens with the visitors arriving, and continues by illustrating the everyday life of the lepers. There are no unpleasant shots of advanced stages of leprosy, and the film attempts to show that leprosy, although a very serious disease, need not be regarded with the abhorrence which has been attached to it nearly all over the world for thousands of years. It emphasises the near-to-normal life which is led by many inhabitants of the island. It is obvious throughout the film that the good living conditions, the cures effected, and the care and attention which the lepers receive, make them happy and optimistic people.

*PLANTATION PEOPLE. 16 mm. 20 min. Colour. Sound. Sound Services Ltd. Price approx. £A.30.

This is a well-produced colour film describing the daily life and work of plantation workers in Trinidad, in the island of Jamaica. It opens with some colourful shots of the island and its villages, and then shows briefly the harvesting and processing of some of the main crops grown on the island: coconuts, grapefruit, bananas, and sugar cane. The main theme is cocoa (the film is sponsored by Messrs. Cadbury Bros., but is virtually free of advertising matter) and there are many excellent scenes of collecting and opening the cocoa pods, fermenting, drying the beans, and finally bagging them for export. The film finishes with the return of the workers to their homes at the end of the day.

A good general interest film, although perhaps some of the sequences could have been improved by cutting, as they tend to be too long.

*SAMOA. 16 mm. 20 min. Black and white. Sound. New Zealand National Film Board. Price approx. £A.24.

This short black and white documentary film shows something of the life and customs of the people of Western Samoa. The film emphasises that despite the introduction of many modern amenities into the island, the people still maintain the best of their own ways of living. Interesting shots of the film include: Samoans husking coconuts, building a church, rounding up cattle, tending citrus groves, receiving medical and dental care, children taking part in native dances and singing, attending school and playing games, and the training of nurses at the hospital.

Photography and editing are good, and this film should appeal to both adult and child audiences.

*TREE OF WEALTH. 16 mm. 10 min. Black and white. Sound. Central Office of Information. Price approx. £A.7/10/-.

The "tree of wealth" refers to the coconut palm. Its economic importance to the people of Travancore, Southern India, is well detailed in this interesting documentary film, which describes how both cottage industry and factory systems are able to utilize practically every part of it in making a wide range of useful products. Photographic sequences show: the use of the dried kernels for copra and oil production; how the husks are soaked and beaten to provide fibre for making yarn, coir and plaited matting and bags; how the shells are used for fuel, vases, and other ornaments; the way in which the fronds are used for roofing material; the manner in which tree trunks are sawn to make building materials; and how even the flowers are used to produce toddy and vinegar.

The whole film is well produced with an informative commentary and should be of interest to both indigenous and European audiences in the Pacific Islands.

Filmstrips

*BAKER. (Men at Work Series.) Produced by Common Ground Ltd., London. Black and white. 38 frames. Subtitles. Teaching notes. Published price stg.16s.6d.

Subject: Baking of bread and making cakes.
Medium: Photographs.
Technical Standard: Good.
Comment: Produced in collaboration with the National Association of Master Bakers, Confectioners and Caterers, this strip depicts the everyday work of the baker. It is divided into two parts: the first section deals with bread making and shows very effectively the various processes involved from the time the flour is received from the mill until the loaf is sold to the customer; the second part describes the methods of making cakes and pastry, including the icing of cakes.

The material is well presented and the teaching notes provide much interesting information.

CAMERA OPTICS. An introduction to Photography. Produced by Common Ground Ltd., London. Black and white. 32 frames. Subtitles. Teaching notes. Published price stg.16s.6d.

Subject: Simple optics and using a camera.
Medium: Diagrams, drawings and photographs.
Technical Standard: Very good.
Comment: This well-planned filmstrip is intended as a simple introduction to certain principles of optics, with particular application to the operation of a camera. After describing the essential points of the pin hole camera, the box camera, and the folding camera, the strip is divided into four main sections. Under the heading *How the Image is Formed* the action and limitations of a pin hole camera are explained and some elementary camera terms are introduced. The second deals with *The Lens*, and covers in greater detail the general principles of photography, including the use of the camera for distant views and close ups. Then the use of the *Lens Stop*, to alter the lens aperture, and subsequently the illumination and depth of focus is clearly demonstrated. In the last sequence *The View Finder*, the principle and value of the different types of view finder are well detailed.

All pictures and diagrams have been arranged in a clear and simple sequence, and the method of showing various photographic faults by combining actual photographs and diagrams on each frame is particularly good. The teaching notes are comprehensive, and contain suggestions for many simple but interesting experiments with pin hole cameras, mirrors and lenses. Secondary and technical science schools may find this strip very useful.

CARPENTRY SERIES. Produced by Unicorn Head Visual Aids Ltd., London.

(1) SAWS, CHISELS AND GOUGES. Black and white. 34 frames. Captions and subtitles. Teaching notes. Published price stg.12s.6d.

(2) PLANES AND SPOKESHAVES. Black and white. 36 frames. Captions and subtitles. Teaching notes. Published price stg.12s.6d.

Subject: Care and use of carpenter's tools.
Medium: Drawings and photographs.
Technical Standard: Good—average
Comment: These two filmstrips are intended as an elementary introduction to the care and use of certain carpenter's tools. The first part describes the various types of saws, chisels, and gouges and gives instructions for their correct handling, general care and maintenance. The second strip follows a similar theme, and deals with planes and spokeshaves.

Photographs and diagrams are very clear, and these strips should be of value in training schools having woodworking classes. The teacher's notes are brief, but probably adequate for an instructor with a sound knowledge of the subject.

COCOA AND CHOCOLATE. (Primary Geography Series.) Produced by Common Ground Ltd., London. Black and white. 27 frames. No captions or subtitles. Teaching notes. Published price stg.15s.

Subject: Method of growing, manufacture, and marketing of cocoa and chocolate.
Medium: Photographs and maps.
Technical Standard: Average.
Comment: The first and last pictures in this strip are identical: an illustration of a child drinking a cup of cocoa, the first being the starting point of the enquiry into the origin of cocoa, and having told the story of its growing, manufacture, and marketing, the full circle back to its domestic usage is reached. One of the early frames illustrates the chief cocoa growing areas of the world, but omits entirely any reference to the Pacific; the frames dealing with the growing of the crop show West African conditions, but in spite of this there is no reason why this filmstrip should not prove at least of some interest from a social studies viewpoint for Pacific islanders.
The teaching notes are fairly simple, and should assist in provoking discussion.

COMMUNITY DEVELOPMENT IN WEST AFRICA. Produced by Central Office of Information, H.M.S.O., London. Black and white. 21 frames. Teaching notes. Published price stg.5s.

Subject: Community development.
Medium: Photographs.
Technical Standard: Good.
Comment: Community effort is one way of turning dreams into reality. This excellent filmstrip shows how the people in some areas of Nigeria have, by determination and co-operation, helped themselves to improve their living conditions. Projects dealt with include road making, drains, water supply, marketing of products and learning a trade.
Although the setting is African, the ideas may be applicable to other undeveloped areas. Photography is good, and the teaching notes are adequate.

COTTON. (Primary Geography Series.) Produced by Common Ground Ltd., London. Black and white. 33 frames. Teaching notes. Published price stg.15s.

Subject: Growing and picking cotton; manufacture of cotton gods.
Medium: Maps, diagrams and photographs.
Technical Standard: Good.
Comment: A general study of cotton growing and its subsequent use in the manufacture of various cotton goods. A map shows the distribution of the main cotton growing areas of the world and this is followed by pictures illustrating the method of planting, harvesting, spinning and weaving, and printing the fabric. Other frames describe some commercial uses of cotton and the products of the cotton seed.
This strip has been well prepared and contains much useful information.

LAND TRANSPORT. Produced by Common Ground Ltd., London. Black and white. 42 frames. Teaching notes. Published price stg.15s.

Subject: History of land transport.
Medium: Drawings and photographs.
Technical Standard: Very good.
Comment: The object of the strip is to show the development of land transport from earliest times up to the present day. It commences with pictures of early man carrying an animal; then illustrates the use of a sledge and making carts with roller wheels; other sequences show the use of pack animals, early coaches, sedan chairs; and finally the evolution of our present day trains, trams, buses, motor cars and lorries.
The drawings and photographs are clear and instructive, whilst the teaching notes are very informative and interesting to read.

LIVING BEFORE HISTORY. Part 2. Farmers and Craftsmen. Isotypes strips. Produced by Common Ground Ltd., London. Colour. 26 frames. Captions. Teaching notes. Published price stg.25s.

Subject: Early man's agriculture and crafts.
Medium: Drawings.
Technical Standard: Very good.
Comment: The first strip in this series, entitled *Cave Men & Hunters*, was reviewed in Pacific Reading, No. 4, September, 1953. This second part continues the story of the development of early civilizations and deals with first dwellings, farming, pottery making, spinning and weaving, hunting, the discovery of metals, the wheel and the beginnings of trade.
The technical quality of the illustrations is very good, and the short caption on each frame adds to the value of the picture.

THE MOON. (Astronomy Series.) Produced by Common Ground Ltd., London. Black and white. 35 frames. Teaching notes. Published price stg.16s.6d.

Subject: The moon.
Medium: Photographs and diagrams.
Technical Standard: Good—average.
Comment: This filmstrip is one of a series intended to give pupils a basic knowledge of our solar system. In this particular sequence the earth's own satellite—the moon—is dealt with; its general nature and main effects on the earth are well described by means of photographs and diagrams. Topics covered include: Moon and Earth relationship; phases of the moon; solar and lunar eclipses; the causes of tides; and finally a comparison of the surfaces of the earth and moon.
The teaching notes are well written and provide ample material for an interesting lesson on the subject.

RUBBER. (Primary Geography Series.) Produced by Common Ground Ltd., London. Black and white. 32 frames. Teaching notes. Published price stg.15s.

Subject: Production and use of rubber.
Medium: Maps, diagrams and photographs.
Technical Standard: Good.
Comment: The production and main uses of rubber, an important commodity in our daily life, are well detailed in this interesting strip. Early frames deal with growing, collecting, processing and packing the crude rubber for export; the remainder of the strip describes many everyday applications of this product, such as making motor and bicycle tyres, tennis balls, Wellington boots, and hot water bottle, to mention a few.

SUGAR. (Primary Geography Series.) Produced by Common Ground Ltd., London. Black and white. 32 frames. Teaching notes. Published price stg.15s.

Subject: Sugar growing and processing.
Medium: Maps, diagrams and photographs.
Technical Standard: Good—average.
Comment: A simple straightforward account of the production of cane and beet sugar. The first fourteen frames deal with the growing, harvesting and processing of cane sugar, whilst the remainder of the strip is concerned mainly with sugar beet cultivation and extraction. The pictures are generally good and arranged in

Useful Animals of the World

Edited by L. J. F. BRIMBLE and E. M. EDWARDS

These forty magnificent plates (21 x 17 inches), specially drawn in full colour by William Reeves, cover the animals in their natural habitats—terrestrial, marine and fresh-water.
£4 the set. Reference Book, 12s. 6d.

Wall Map of the Pacific

A new large wall map (38 x 52 inches) of the Pacific area in full colour. Mounted on cloth, varnished and on rollers.
30s.

Atlas for South-East Asia

R. E. PARRY

A new atlas of the world, printed in colour with lettering in English. Special features include detailed maps of British North Borneo, the Federation of Malaya, Singapore, Sarawak, Brunei and Hong Kong. 5s.

The Story of Sir Ronald Ross

E. F. DODD

Published in Macmillan's *Lives to Remember* series, this story of Sir Ronald Ross and his fight against malaria is intended for non-detailed study and is written within a vocabulary of two thousand words. Illustrated. 1s. 6d.

Macmillan & Co. Ltd.

St. Martin's Street, London, W.C.2

a logical order. The map showing the various cane and beet growing aeas could be clearer as it is difficult to distinguish the limits of some boundaries; also there is no reference to the Pacific area. Well detailed teaching notes are provided.

WHAT ARE BANKS. Produced by Common Ground Ltd., London. Black and white. 41 frames. Subtitles. Teaching notes. Published price stg.15s.

Subject: Simple banking procedures.
Medium: Drawings, diagrams and photographs.
Technical Standard: Good—average.
Comment: The aim of this strip is to explain some functions of banks in modern commerce. In the first part, a schoolboy society using marbles as a means of payment is used to illustrate three important aspects of banking—the safe keeping of money, the use of cheques, and the creation of credit. At the end of each sequence, a picture is added to relate the particular aspects of banking to everyday practice. The second part of the strip deals with the principle of the Central Bank and its function in controlling the credit policy of commercial banks.
The teacher's notes are well detailed, and the strip would be of interest to secondary schools or co-operative societies.

MERCHANT NAVY CADET. Produced by Common Ground Ltd., London. Black and white. Sub-titles. Teaching Notes. Published price: Stg.16s. 6d.

Subject: Training boys for Merchant Navy.
Medium: Photographs.
Technical Standard: Very good.
Comment: An interesting film strip which follows a young cadet from his first joining a navigation training school to life aboard his first ship. Different aspects of the work are shown, practical and theoretical, and the use of the same boy in each picture gives the strip continuity and realism. The photographs are good, the teaching notes interesting, the subject an attractive one. . . 12 + ages.

NETBALL. Produced by Common Ground Ltd., London. Black and white. 38 frames. No captions or sub-titles. Teaching notes. Published price: Stg.16s. 6d.

Subject: How to play netball.
Medium: Photographs, diagrams.
Technical Standard: Good.
Comment: Though the filmstrip is intended for teaching children how to play netball it should also be useful to those who are already familiar with the game in showing up the finer points and clarifying the rules. Starting off with plans of the court and the players' places, it demonstrates how to make throws, passes and goal shots. There are also pictures showing positions of the feet, how to stand when shooting goals, jumping, dodging, catching and so on. Though simple and uncluttered, the pictures need a good commentary to accompany them. . . . . 11 + ages.

TEXTILE DESIGN. Produced by Common Ground Ltd., London. Black and white. 36 frames. Sub-titles. Teaching Notes. Published price: Stg.16s. 6d.

Subject: Weaving and printing in English textile industry.
Medium: Photographs.
Technical Standard: Good.
Comment: Though this filmstrip may be slightly advanced, the subject is such a straightforward one that there should be no difficulty in following it. The first main section is concerned with the raw materials of textiles: wool, cotton, flax, silk, and synthetic fibres. Then comes a sequence on weaving, and finally two attractive sequences on decoration; first, patterns that are woven into the fabric, followed by those that are printed on by different methods. Good photographs and interesting teaching notes. . . 12 + ages.

Broadcasting In The South Pacific

(Continued from page 45)

Education Department compound at Malifa. The schools broadcasts are listened to on Government-issued sets, of which there were in 1955, 150 in village schools and mission schools, and 41 in Faipuli, making a total of 191 sets serving about 12,000 children.

The purchase of individual receivers is encouraged by exempting them from customs duty. In 1955 there were approximately 1,500 privately-owned receiving sets, over 300 of which were in Apia and its environs. A registration fee of 5/- is payable on privately-owned sets.

An interesting documentary programme about Western Samoa (on tape) was contributed to the South Pacific Commission's clearing house service for broadcast recordings by 2AP. It was recorded in the 2AP studios and was originally broadcast over Radio New Zealand, whose programmes are received nightly in Western Samoa.

It is apparent from this brief outline of broadcasting in the Pacific area that all territories are placing increasing emphasis on the importance of broadcasting as a medium for providing both information and entertainment for Europeans and island peoples, and that they are making every effort to expand their services as far as their resources permit.

The main problems seem to be the high cost of equipment and the shortage of trained staff. The scarcity of programme material, especially for island peoples, can only be overcome by the provision of additional staff, but it is hoped that the exchange of recordings of island music, which is being organized through the Commission's clearing-house service, will help to alleviate the scarcity to some degree.

PRINCIPAL COMMISSION PUBLICATIONS

- *SPC QUARTERLY BULLETIN:*
  Annual Subscription ..... *8/-Stg.*

- *TECHNICAL PAPERS:* These are technical reports on a wide range of subjects in the economic, social and health fields (list on back cover).

- *OFFICIAL RECORDS: Proceedings of Sessions of the South Pacific Commission* (First to Fifteenth); *Annual Reports of the South Pacific Commission* (1948 *to* 1955); *Reports on the First and Second South Pacific Conferences; Progress Reports on Action Taken on the Resolutions of the First and Second South Pacific Conferences.*

- *EXPERT REPORTS:* The Oxford University Press is publishing a series of Expert Reports in book form for the Commission. Four have been issued to date:

  VOCATIONAL TRAINING IN THE SOUTH PACIFIC. By R. A. Derrick, M.B.E., A.M.I.S.E., F.R.G.S. Mr. Derrick's report consists of a survey of the facilities for professional and technical training in the whole of the South Pacific, and of recommendations for future development.
  Price in Australia ..... *30/-A.*

  MOTURIKI: A PILOT PROJECT IN COMMUNITY DEVELOPMENT. By Howard Hayden. A fully documented, copiously illustrated report on a pilot project in community development carried out under Commission sponsorship on the island of Moturiki by the Government of Fiji.
  Price in Australia ..... *42/-A.*

  SOCIAL ANTHROPOLOGY IN MELANESIA: A Review of Research by Dr. A. P. Elkin, Professor of Anthropology in the University of Sydney. In this report Dr. Elkin reviews past, present and future anthropological research in Melanesia, designed to advance native welfare.
  Price in Australia ..... *27/6A.*

  SOCIAL ANTHROPOLOGY IN POLYNESIA: A Review of Research by Dr. Felix M. Keesing, Professor of Anthropology, Stanford University. This is a parallel study to Professor Elkin's report on anthropological research in Melanesia.
  Price in Australia ..... *27/6A.*

- *BIBLIOGRAPHY:* The following bibliography has been published for the Commission by Oxford University Press:

  A BIBLIOGRAPHY OF BIBLIOGRAPHIES OF THE SOUTH PACIFIC: Compiled by Miss Ida Leeson, former Mitchell Librarian. A basic catalogue arranged by area and subject.
  Price in Australia ..... *15/-A.*

- *OTHER PUBLICATIONS:*

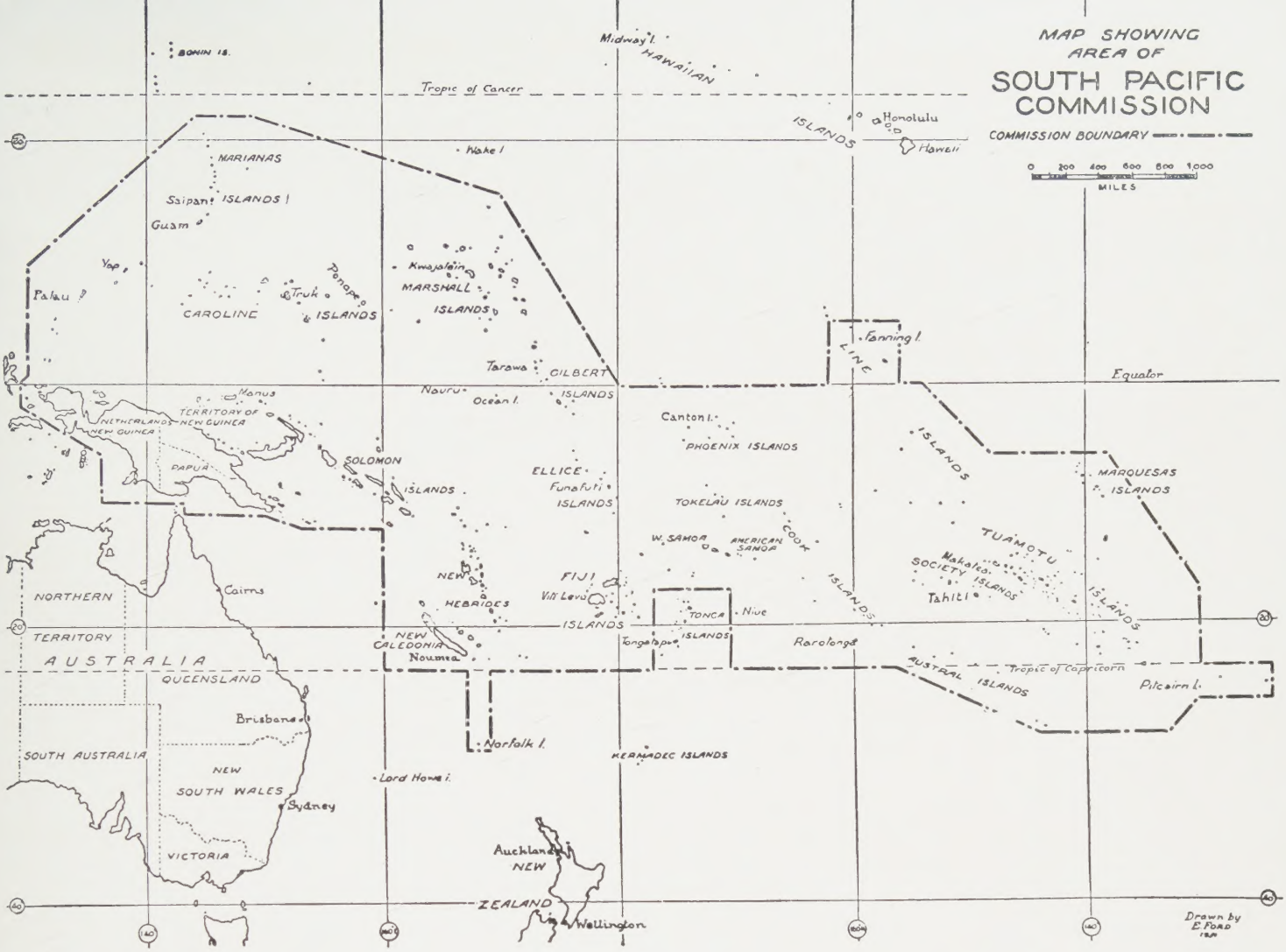
  The Construction of Literacy Primers for Adults: By Dr. K. Neijs ..... *5/-Stg.*

  How to Make Your Own Filmstrips: By Nancy Phelan. *2/6Stg.*

The above volumes are obtainable through leading booksellers.

INQUIRIES REGARDING COMMISSION PUBLICATIONS MAY BE DIRECTED TO THE SECRETARY-GENERAL, SOUTH PACIFIC COMMISSION, NOUMEA, NEW CALEDONIA, OR TO G.P.O. BOX 5254, SYDNEY, AUSTRALIA.

Printed by Bridge Printery Pty. Ltd., 117 Reservoir St., Sydney.



South Pacific Commission Technical Papers

(continued from outside back cover)

45. **The Nimboran Community Development Project.** Dr. J. van Baal, Director of the Bureau of Native Affairs, Netherlands New Guinea. June 1953.
46. **The Koror Community Centre.** Reports supplied by the High Commissioner, Trust Territory of the Pacific Islands. August 1953.
74. **Educational Aspects of Community Development.** R. Thomson. January 1955. (4/-. stg.)
84. **The Communities Project Approach to Economic Development.** H. Belshaw. July 1955.

EDUCATION

3. **The Village Library.** April 1950.
4. **Visual Aids in Education in the South Pacific.** A. L. Moore, Visual Aids Consultant. April 1950.
13. **Vocational Training Facilities in Australia for Students from South Pacific Territories.** May 1951 (Out of print.)
14. **Educational Broadcasts to Samoan Village Schools.** Department of Education, Western Samoa. May 1951.
15. **Libraries for Beginners.** Dr. and Mrs. Kenneth Todd, Kwato Mission, Eastern Papua. July 1951.
32. **Types of Organization in Adult and Mass Literacy Work.** D. B. Roberts, Organizer of Island Literature, South Pacific Commission. August 1952.
44. **The Use of the Vernacular in Teaching in the South Pacific.** G. J. Platten. June 1953.
47. **Central Vocational Training Institution.** F. J. Harlow. August 1953. (5/-. stg.; plans available sep., 5/-. stg.)
72. **Literacy Teaching for Adults.** Karel Neijs. November 1954. (5/-. stg.)
73. **Educational Evaluation—A Documentary Survey.** J. C. Nield. December 1954.

OTHER SUBJECTS

6. **A Preliminary List of Economic Plants of New Caledonia.** J. Barrau, Director of Agriculture, New Caledonia. July 1950.
7. **A Preliminary List of Plants Introduced into Tahiti.** July 1950.
16. **Some Notes and Suggestions Regarding Conservation of Important Archaeological Sites and Archives in South Pacific Territories.** F. M. Keesing. August 1951. (5/-. stg.)
25. **Report of Fisheries Conference, Noumea.** May 1952.
28. **Coral as a Building Material.** July 1952.
30. **Bibliography of Cargo Cults and other Nativistic Movements in the South Pacific.** Ida Leeson. July 1952.
41. **Social Problems of Non-Maori Polynesians in New Zealand.** Rev. R. L. Challis, Pastor of the Pacific Islanders' Congregational Church in New Zealand. February 1953.
49. **The Social and Cultural Position of Micronesian Minorities on Guam.** R. R. Solenberger. October 1953.
53. **Reclamation of Tidal Mud Flats in Tonga.** W. Straatmans, Head of the Department of Agriculture, Nuku'alofa, Tonga. March 1954.
70. **A Linguistic Survey of the South-Western Pacific.** Dr. A. Capell. November 1954. (20/-. stg.)
71. **Film and Filmstrip Catalogue.** September 1954. (3/-. stg.)
76. **A Bibliography of Tropical Housing.** January 1955.
93. **Clearing House Service for Broadcast Recordings—Information and Catalogue.** July 1956.

South Pacific Commission Technical Papers

Copies of Technical Papers may be procured from the South Pacific Commission, Nouméa, New Caledonia, or G.P.O. Box 5254, Sydney, Australia. Except where otherwise stated, price per copy is 2/- stg., post free by surface mail.

NUTRITION

18. **Report on Nutrition Investigations by the South Pacific Commission in 1950.** November 1951.
22. **Chemical Composition of the Milk of New Hebridean Mothers.** F. E. Peters, biochemist, South Pacific Commission. February 1952.
23. **Nutrition Research Conducted in New Hebrides during 1951.** Sheila Malcolm, nutritionist, South Pacific Commission. April 1952.
50. **Nutrition Investigation in New Caledonia.** Sheila Malcolm. October 1953.
58. **Bibliography of the Nutritional Aspects of the Coconut.** F. E. Peters. April 1954.
59. **Dietary and Nutritional Problems in the Pacific.** Dr. E. Massal. April 1954.
63. **Diet and Nutrition in American Samoa.** Sheila Malcolm. August 1954.
83. **Diet and Nutrition in the Trust Territory of the Pacific Islands.** Sheila Malcolm. July 1955.
85. **Etudes sur la Nutrition et l'Alimentation dans les Etablissements Francais de l'Oceanie** (Summary and Conclusion in English). Sheila Malcolm. April 1955.

PUBLIC HEALTH

12. **Tuberculosis Investigations by the South Pacific Commission in 1950.** May 1951.
24. **A Survey of Leprosy on the Island of Nauru.** Dr. C. J. Austin, Director, Makogai Leprosy Hospital, Fiji. April 1952.
27. **A Survey of Leprosy in the British Solomon Islands Protectorate.** Dr. C. J. Austin. July 1952.
56. **Leprosy in Netherlands New Guinea.** Dr. Norman R. Sloan. April 1954.
57. **Leprosy in the Trust Territory of the Pacific Islands.** Dr. Norman R. Sloan. April 1954.
62. **Leprosy in American Samoa.** Dr. Norman R. Sloan. July 1954.
64. **Dental Conditions in School Children of American Samoa.** Dr. Raymond G. Neubarth. August 1954.
67. **Ophthalmological Survey of the Trust Territory.** Dr. H. E. Crawford. September 1954.
69. **Leprosy in Western Samoa and the Cook Islands.** Dr. Norman R. Sloan. October 1954.

MOSQUITO-BORNE DISEASES

17. **Conference of Experts on Filariasis and Elephantiasis, Tahiti: Summary of Proceedings.** September 1951.
33. **A Survey of Malaria in the British Solomon Islands Protectorate.** Dr. R. H. Black, School of Public Health and Tropical Medicine, University of Sydney. November 1952.
60. **Some Aspects of Malaria in the New Hebrides.** Dr. R. H. Black. May 1954.
61. **Malaria in the Trobriand Islands.** Dr. R. H. Black. May 1954.
65. **Annotated Bibliography of Filariasis and Elephantiasis.** September 1954. (5/-. stg.)
66. **Distribution of Filariasis in the South Pacific Region.** Dr. M. O. T. Iyengar. September 1954. (5/-. stg.)
68. **Malaria in the Torres Straits Islands.** M. Josephine Mackerras and Dorothea F. Sandars. October 1954.
80. **Malaria Control and Research in Netherlands New Guinea.** Dr. R. H. Black. March 1955.
81. **Malaria in the South-West Pacific.** Dr. R. H. Black. March 1955.
86. **Distribution of Mosquitoes in the South Pacific Region.** Dr. M. O. T. Iyengar. 1955. (8/-. stg.)
88. **Annotated Bibliography of Filariasis and Elephantiasis. Part 2.** Dr. M. O. T. Iyengar. January 1956. (6/-. stg.)

TROPICAL CROPS

19. **Report on Copra Grading.** November 1951.
21. **Note on the Mycoflora of Rice Seed in the Territories of the South Pacific.** Dr. F. Bugnicourt, Director, Institut Francais d'Oceanie. January 1952.
31. **Cocoa Plantation Management in Western Samoa.** D. R. A. Eden, General Manager, New Zealand Reparation Estates, and W. L. Edwards, Assistant General Manager. October 1952.
36. **Cocoa Growing in Fiji Islands.** D. H. Urquhart, former Director of Agriculture, Gold Coast. December 1952.
37. **Cocoa Growing in Netherlands New Guinea.** D. H. Urquhart. January 1953.
38. **Coffee Growing in New Caledonia.** D. H. Urquhart. January 1953.
39. **Cocoa Growing in Western Samoa.** D. H. Urquhart. January 1953.
40. **Cocoa Growing in New Hebrides.** D. H. Urquhart. January 1953.
48. **The Management of Coconut Plantations in Western Samoa.** D. R. A. Eden. September 1953.
55. **Grading of Fresh Fruit Exports from South Pacific Territories.** April 1954.
82. **The Manufacture of Copra in the Pacific Islands.** W. V. D. Pieris. July 1955. (6/-. stg.)
87. **L'agriculture vivriere autochtone de la Nouvelle-Caledonie,** par Jacques Barrau; precedee de l'organisation sociale et coutumiere de la population autochtone, par Jean Guiart. Janvier 1956. Available in French only. (20/- stg.)
94. **Food Plants of the South Sea Islands.** Dr. E. Massal and Jacques Barrau. September 1956. (6/- stg.)

PESTS AND DISEASES OF PLANTS AND ANIMALS

8. **Insect Pests in the Wallis Islands and Futuna.** From report by F. Cohic, Entomologist, Institut Francais d'Oceanie. December 1950.
9. **Report of Plant and Animal Quarantine Conference, Suva.** April 1951.
34. **Rhinoceros Beetle Control in the Kingdom of Tonga.** L. J. Dumbleton, Plant and Animal Quarantine Officer, South Pacific Commission. November 1952.
77. **A List of Diseases and Parasites of Animals Recorded in the South Pacific Territories.** Bilingual. December 1954.
78. **A List of Plant Diseases Recorded in South Pacific Territories.** Bilingual. December 1954.
79. **A List of Insect Pests Recorded in South Pacific Territories.** Bilingual. August 1955. (6/-. stg.)

ECONOMIC CONDITIONS

54. **The Pacific Islander and Modern Commerce.** V. D. Stace, Assistant Economist, Reserve Bank of New Zealand. March 1954.
89. **Small-Scale Industry for the South Pacific—Preliminary Papers.** Cyril S. Belshaw. March 1956. (4/-. stg.)
90. **Industrial Activity in Selected Areas of the South Pacific.** K. H. Danks. March 1956. (5/-. stg.)
91. **Western Samoa—An Economic Survey.** V. D. Stace. June 1956 (6/-). stg.)
92. **Economic Aspects of the Coconut Industry in the South Pacific.** E. J. E. Lefort. September 1956. (4/- stg.)

CURRENT RESEARCH

5. **Fisheries and Animal Health Research Projects of Significance for the South Pacific Region,** conducted under the authority of the C.S.I.R.O., Australia. May 1950.
20. **Research Workers in the South Pacific** (now T.P. No. 52). December 1951.
29. **Current Research in the South Pacific in the Field of Economic Development.** July 1952.
43. **Research in Queensland in Tropical Plant and Animal Industries.** Jacques Barrau, Technical Officer. South Pacific Commission. May 1953.
52. **Social Science Research in the Pacific Islands.** December 1953. (Revised edition of Technical Paper No. 20.)

CO-OPERATIVES

1. **The Co-operative Movement in the Gilbert and Ellice Islands.** H. E. Maude. February 1949.
10. **Bibliography of Co-operation in the South Pacific** (Now T.P. No. 51) April 1951.
42. **The Co-operative Movement in Papua and New Guinea.** Prepared by the Registry of Co-operative Societies, Port Moresby. February 1953.
51. **A Biblography of Co-operation in the South Pacific.** December 1953. (Revised Edition of Technical Paper No. 10.)
75. **Catalogue of the Commission's Co-operative Library** (Bibliography of Co-operation). January 1955. (5/-. stg.)

COMMUNITY DEVELOPMENT

2. **Community Development.** March 1950.
11. **Interim Reports on the Moturiki (Fiji) Community Development Project.** Howard Hayden, Director of Education, Fiji. May 1951.
26. **Further Education in the Cook Islands.** P. F. Henderson, Officer for Further Education, Cook Islands. July 1952.
35. **The Purari Delta—Background and Progress of Community Development.** November 1952.

(continued on inside back cover)